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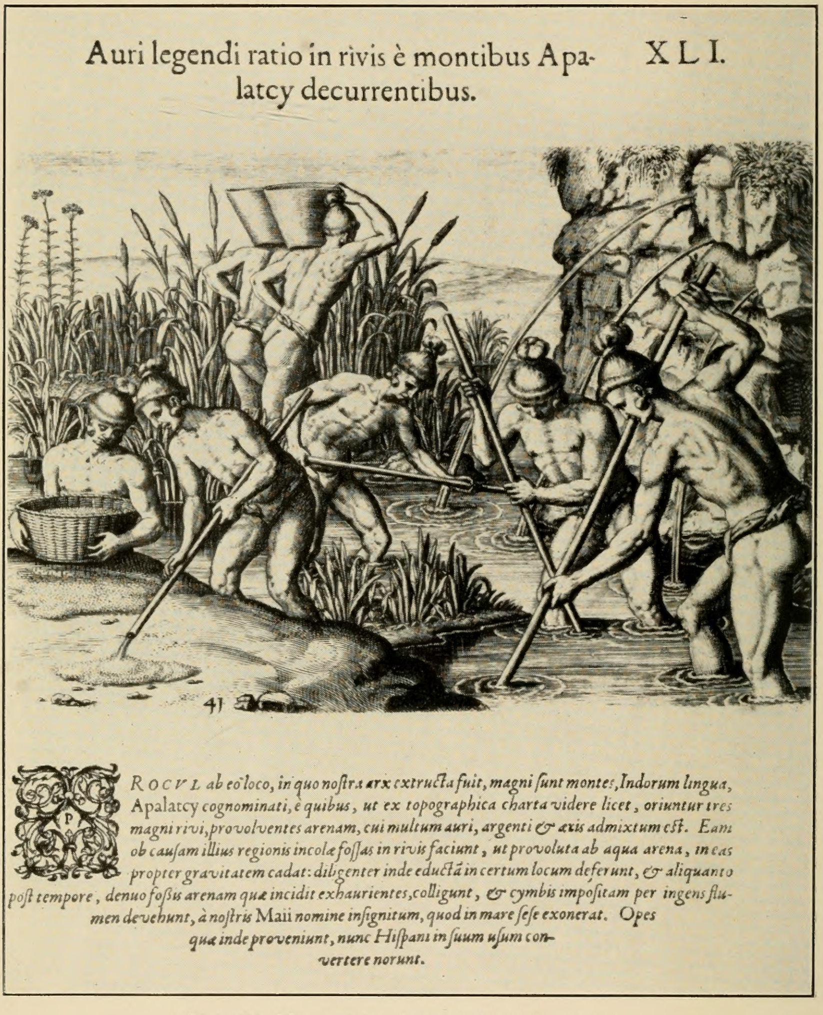

Auri legendi ratio in rivis è montibus Apalatcy decurrentibus. XLI.

PROCVL ab eõ loco, in quo noſtra arx extructa fuit, magni ſunt montes, Indorum lingua, Apalatcy cognominati, è quibus, ut ex topographica charta videre licet, oriuntur tres magni rivi, provolventes arenam, cui multum auri, argenti & æris admixtum eſt. Eam ob cauſam illius regionis incolæ foſſas in rivis faciunt, ut provoluta ab aqua arena, in eas propter gravitatem cadat: diligenter inde eductã in certum locum deferunt, & aliquanto poſt tempore, denuo foſsis arenam quæ incidit exhaurientes, colligunt, & cymbis impoſitam per ingens flumen devehunt, à noſtris Maii nomine inſignitum, quod in mare ſeſe exonerat. Opes quæ inde proveniunt, nunc Hiſpani in ſuum uſum convertere norunt.

PLACER MINING BY INDIANS OF GEORGIA.

SMITHSONIAN INSTITUTION
BUREAU OF AMERICAN ETHNOLOGY
BULLETIN 128

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Numbers 13–18

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LETTER OF TRANSMITTAL

Smithsonian Institution,
Bureau of American Ethnology,
Washington, D. C., March 1, 1940.

Sir: I have the honor to submit the accompanying manuscripts, entitled "The Mining of Gems and Ornamental Stones by American Indians," by Sydney H. Ball; "Iroquois Suicide: A Study in the Stability of a Culture Pattern," by William N. Fenton; "Tonawanda Longhouse Ceremonies: Ninety Years after Lewis Henry Morgan," by William N. Fenton; "The Quichua-Speaking Indians of the Province of Imbabura (Ecuador) and their Anthropometric Relations with the Living Populations of the Andean Area," by John Gillin; "Art Processes in Birchbark of the River Desert Algonquin, a Circumboreal Trait," by Frank G. Speck; "Archeological Reconnaissance of Southern Utah," by Julian H. Steward; and to recommend that they be published as a bulletin of the Bureau of American Ethnology.

Very respectfully yours,

M. W. Stirling, *Chief.*

Dr. C. G. Abbot,
Secretary of the Smithsonian Institution.

PUBLISHER'S NOTE

A separate edition is published of each paper in the series entitled "Anthropological Papers." Copies of Papers 1–18 are available at the Bureau of American Ethnology, Smithsonian Institution, and can be had free upon request.

List of Anthropological Papers published previously

No. 1. A Preliminary Report on Archeological Explorations at Macon, Ga., by A. R. Kelly. Bull. 119, pp. v-ix, 1–68, pls. 1–12, figs. 1–7. 1938.
No. 2. The Northern Arapaho Flat Pipe and the Ceremony of Covering the Pipe, by John G. Carter. Bull. 119, pp. 69–102, figs. 8–10. 1938.
No. 3. The Caribs of Dominica, by Douglas Taylor. Bull. 119, pp. 103–159, pls. 13–18, figs. 11–37. 1938.
No. 4. What Happened to Green Bear Who Was Blessed with a Sacred Pack, by Truman Michelson. Bull. 119, pp. 161–176. 1938.
No. 5. Lemhi Shoshoni Physical Therapy, by Julian H. Steward. Bull. 119, pp. 177–181. 1938.
No. 6. Panatübiji', an Owens Valley Paiute, by Julian H. Steward. Bull. 119, pp. 183–195. 1938.
No. 7. Archeological Investigations in the Corozal District of British Honduras, by Thomas and Mary Gann. Bull. 123, pp. v-vii, 1–57, 61–66, pls. 1–10, figs. 1–11. 1939.
Report on Two Skulls from British Honduras, by A. J. E. Cave. Bull. 123, pp. 59–60. 1939.
No. 8. Linguistic Classification of Cree and Montagnais-Naskapi Dialects, by Truman Michelson. Bull. 123, pp. 67–95, fig. 12. 1939.
No. 9. Sedelmayr's Relacion of 1746. Translated and edited by Ronald L. Ives. Bull. 123, pp. 97–117. 1939.
No. 10. Notes on the Creek Indians, by John R. Swanton. Bull. 123, pp. 119–159, figs. 13, 14. 1939.
No. 11. The Yaruros of the Capanaparo River, Venezuela, by Vincent Petrullo. Bull. 123, pp. 161–290, pls. 11–25, figs. 15–27. 1939.
No. 12. Archeology of Arauquin, by Vincent Petrullo. Bull. 123, pp. 291–295, pls. 26–32. 1939.

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SMITHSONIAN INSTITUTION
Bureau of American Ethnology
Bulletin No. 128

Anthropological Papers, No. 13

The Mining of Gems and Ornamental Stones by American Indians

By SYDNEY H. BALL

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THE MINING OF GEMS AND ORNAMENTAL STONES BY AMERICAN INDIANS

BY SYDNEY H. BALL

> *I tell thee, golde is more plentifull there* [*Virginia*] *then copper is with us * * * Why, man, all their dripping-pans * * * are pure golde: * * * and for rubies and diamonds, they goe forth on holydayes and gather 'hem by the sea-shore, to hang on their childrens coates, and sticke in their childrens caps, as commonly as our children, weare saffron-gilt brooches and groates with hoales in 'hem.*[1]

INTRODUCTION

When Europeans arrived in America they found the American Indian largely in the Stone Age, although a number of tribes, and particularly those of Mexico, Central America, Colombia, and Peru, used certain metals. Imbued with our conception of racial superiority, we rarely think of the Indian as a capable prospector and a patient, if primitive, miner. Yet the rapid development of mining in Mexico and Peru after the conquests was mainly owing to the large number of ore bodies opened up by the local aborigines. Lust on the part of the Spaniards for gold, silver, and precious stones and, to express it mildly, canny concern on the part of the English and French for such wealth, were the activating forces behind much of the exploration of America.

Both to the American Indian and the white man, mineral products were essential, but the former used coal mainly as an ornament and petroleum as a liniment, while the latter could not be inveigled to "rush" a new obsidian "find" to supply weapons of war.

This article treats of the gems and ornamental stones used by the Indian before he came in contact with the white man. His metal mining has been frequently described: The pits he dug on the Lake Superior Copper Range; his exploitation of the mercury mines of New Almaden and Peru for paint; his placer mining in Georgia, Mexico, Central America, the West Indies, northwestern South America, and Brazil; and his gold and silver lode mining in Mexico and Peru. Copper and gold were extensively used; silver, tin, lead, platinum, mercury, and iron (meteoric) less so. Within the United States copper and gold were treated as pebbles and pounded into the shape desired, but in Mexico, Central America, and western South America an elementary smelting technique had been evolved and in certain localities the skill with which metals were forged, cast, alloyed, and plated astonished the conquistadores. Platinum, it may be recalled, was used by the Indian long before it was known to white men.

---

[1] Seagull, a sailor, to Scapethrift in Eastward Hoe, a popular drama by Geo. Chapman, Ben Jonson, and Joh. Marston, 1605. See volume 3, p. 51, of The works of John Marston, 3 vols., London, 1856.

The Indian's knowledge of gems and ornamental stones was, however, much more comprehensive than that of metals and his most extensive mines or, at least, those known to us, were of ornamental stones.

The Indian made use of a large number of gems and ornamental stones, some 84 being known to the writer. His acquaintance with minerals suitable for decorative purposes exceeded in number, at least, that of the peoples of Europe and Asia at the time of the discovery of America. The list, as presented (p. 56) is fairly complete for North and Central America but for South America could doubtless be appreciably extended. Of the early men who made the Folsom points, those of Folsom, N. Mex., used chalcedony, jasper, and obsidian, and those of the Lindenmeier site near Fort Collins, Colo., chalcedony, jasper, moss agate, lignite, quartz, hematite, and agatized wood. It can be said with considerable assurance that at the beginning of our era, or roughly 2,000 years ago, the American Indian used in addition the following precious and decorative stones: Agate, alabaster, azurite, bloodstone, calcite, jadeite, jet, lapis lazuli, malachite, mica, nephrite, common opal, pyrite, satin spar, selenite, serpentine, soapstone, and turquoise. By 1000 A. D. or even earlier, the following, among others, had been added: Amber, carnelian, catlinite, chloromelanite, emerald, fluorspar, galena, garnet, magnesite, marcasite, moonstone, noble opal, sodalite, and variscite.

It is a curious instance of parallel cultural growth that of the 25 stones first used by early man on the eastern and western continents, 16 were common to the two cultures (Ball, 1931, pp. 683–685).

As sources of material on the subject, we have: (1) Artifacts preserved in public and private collections; (2) mine workings, although many which once existed have become obliterated; (3) early and present-day literature; and (4) the traditions and myths of the Indians. Evidence from the latter two sources must be used with discretion, as the mineralogic knowledge, particularly of the early Spanish writers, and of some archeologists, is, to say the least, inadequate, while myths may be of much later origin than the events they describe.

USES OF GEMS AND ORNAMENTAL STONES BY AMERICAN INDIANS

Gems and ornamental stones were used by the aborigines for a large number of different purposes, for nonmetallic minerals served not only their special functions as we know them but also, at least among certain of the Indian tribes, all the uses of metals and, among all of them, certain of the functions of our metals. The principal uses may be listed as follows:

a. Ornaments.—Ornaments consisted of pendants, beads, and carved figures: Gem mosaics were worn among the Pueblos, the semicivilized Mexicans, the Peruvian peoples, etc. The Indian adores vivid colors and he has a childlike love of beautiful pebbles, particularly if brightly colored. To the semicivilized peoples from Arizona to northern Chile, the blue and the bluish-green of the turquoise and the green of jade and emerald had a peculiar fascination. Such stones were eagerly sought and highly valued. The first gained its color from the cloudless sky and the second symbolized the growth of crops; their value being increased by the supernatural power gained thereby. So highly regarded were they that jade could be worn only by nobles among the Aztecs, and among the Yavapai (central Arizona) only a chief (*mastova*) was privileged to wear turquoise bracelets (Gifford, 1932, p. 229). All green stones were treasured by the Yuma medicine men (Corbusier, 1886). The Indian used many materials in their jewelry which, until the introduction of the modern "novelty" jewelry, we would have scorned. Shell, for example, and wood, berries, seeds, iridescent beetle wings and fruit stones, and even worse, for Capt. John Smith, in his history of Virginia, tells us that some of the Virginia Indians wore in holes in their ears small "green and yellow colored snakes near one-half a yard in length"; others "a dead rat tied by the tail." The Cheyenne Indians strung human fingers into necklaces (Bourke, 1890), and the Sioux wore hands as earrings (Mallery, 1893, p. 752, fig. 1278). On the other hand, the custom of the women of the southern Mexican coast and of British Honduras of placing fireflies in their hair, while a bit startling to the white traveler, has, after all, charm.

The use of jade, hematite, turquoise, rock crystal, obsidian, and pyrite inlays in the teeth of Mayan and certain Mexican and South American tribes was, of course, for display rather than as an aseptic measure.

b. Weapons.—Hard stones with conchoidal fracture were eagerly sought for arrow- and spear-heads, knives, and razors. That some of these weapons were effective, we learn from rough old Bernal Diaz, who asserts that a single blow of an Aztec sword, set with obsidian points, would decapitate a horse. The Hudson Bay Eskimo, when lead is scarce, use soapstone as bullets.

c. Household utensils.—Soapstone was widely used for lamps, particularly among the Eskimo, and for cooking utensils by many tribes. Pyrite and quartz were used to produce fire, particularly by the peoples of the extreme northern part of the American Continent (the Eskimo) and of the extreme southern part (the Fuegians). Angular fragments of quartz, and some say obsidian, set in a flat board, are made by a British Guiana tribe and are traded over considerable distances as manioc graters (Farabee, 1917, p. 77). Commerce in these graters was widespread (McGovern, 1927, p. 211). Similar graters were used by the Uaupes in the upper Amazon (Wallace, 1853, pp. 483–484).

d. Surgical instruments.—Shaped rock crystal was used for blood-letting by the California Indians, and lancets of this material and obsidian by the ancient people of Peru. Obsidian knives served their grewsome role when victims were sacrificed to the gods of Mexico, and knives of this material were used in scarification by California Indians and by the Araucanian and the Mapuchian shamans in bleeding the sick.

e. Graving tools.—The Hidatsa of North Dakota cut their pictographs on rock with sharp-pointed quartz fragments, as Richard Spruce infers the Amazonian Indians did.

f. Abrasives.—The Indians of Racine County, Wis., crushed rock crystal to form an abrasive in pipe making (West, 1934, p. 341). Pumice was also used as an abrasive by the Nevada, Nebraska, Montana, and California Indians and by the Eskimo of Cook Inlet, Alaska.

g. Mirrors.—Mirrors were made of obsidian and pyrite by the Aztecs, Mayas, and the Peruvians; and among the Mound Builders mica probably so served. The Eskimo of Hudson Strait use a plate of biotite "so fitted into a leather case as to be seen on either side" (Lyon, 1825, p. 38).

h. Windows.—Selenite and perhaps mica were used in windows by the Pueblos, and Mexican "onyx" by the Aztecs. Selenite was supposed to permit the Pueblos to see out but the keenest eye could not see what was passing in the interior of the feebly lighted rooms (Möllhausen, 1858, vol. 1, p. 157).

i. Embellishment of buildings.—Precious stones were used in quantity by both the Aztecs and the Peruvians in their temples and palaces. Turquoise was, in instances, set in the lintels of the Pueblo houses. Arizona agatized wood was sometimes used as a building stone in constructing the ancient pueblos.

j. Pigments.—Hematite, malachite, and azurite were not only widely used as pendants and in other ways in the mass but, when crushed, as pigments. The latter two furnished the Pueblo people their favorite colors—green and blue. Among the Navaho crushed turquoise was used to paint certain ceremonial objects (Pogue, 1915, p. 103). The green used to dye the wool of Chilkat blankets was derived from copper ores. The British Columbia Indians also used malachite as a pigment. The Pawnees and Mandans heated selenite and from the powder made a whitening used in tanning buckskin. The Navaho medicine men used gypsum as chalk in drawing and the Pueblos merely powdered, or burnt and mixed it with water as whitewash. Calcined gypsum powder was used by the Omahas to clean, whiten, and dry the sinews binding feathers to their arrows. The Aztecs used *chimaltizatl* (selenite) to whiten their paintings (Clavigero, 1807, pp. 16–17). The California Indians procured body paint from a "vermilion cave," the outcrop of the New Almaden mercury mine. Cinnabar was also used by the Aztecs, the Mayas, and the Peruvian Indians. The beautiful pale green brochantite of the Corocoro copper deposit, Bolivia, was used by the local Indians as a source of green pigment before the Spanish arrived (Berton, 1936). The Indians used the brilliant red hewettite (a hydrous calcium vanadate) to make pictographs on the sandstone cliffs of Emery County, Utah. Within one-half mile are commercial vanadium deposits.[2] Black pigments were produced from lignite (Pueblos), from manganese dioxide (Pueblos and Californians), from coal (Haidas), from graphite (New York, New England, and Alaska Indians and Eskimo), from sphalerite ore (Pueblos), from micaceous hematite (Yukon Indians), or from galena (Apache-Yumas). The latter also used calcite and magnesite as white pigments. The Oubeways, on the other hand, used iron sulphate derived from decomposing pyrite as a black dye. The Seri, inhabiting Tiburon Island, Sonoro, used dumortierite as a blue face paint (Kroeber, 1931, p. 27). The Pueblos used jarosite in addition to yellow ochre for yellows and browns (Cosgrove, 1932).

k. Currency.—Among the Indians of California, large obsidian blades and beads made of magnesite were used as standards of barter. The larger of the latter were worth up to $20 (Hodge, 1922, p. 16; Sumner, 1907, p. 152). Black obsidian blades of ordinary length were worth among the Yurok Indians of northern California about $1 an inch; the red obsidian, being rarer, was even more valuable. Blades of 30 to 33 inches in length were worth much more, indeed they were of inestimable value (Kroeber, 1925, pp. 26–27). Turquoise was, perhaps, as near to a unit of value as the Pueblos, Navahos, and Yaquis possessed and nephrite beads were used in somewhat the same way in British Guiana and in the Mayan cities.

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[2] Written communication from Robert H. Sayre, Denver, Colo.

Like most primitive people, the American Indian saw in gems and decorative stones not only beauty but the supernatural and the awe-inspiring. The medicine men among the Cayapa Indians of Ecuador, for example, are unwilling to dispose of the pebbles used in their incantations lest the spirit in the stone become angry, an old Greek idea. Edward Bancroft (1769, pp. 21, 311) states that the Indians of British Guiana in his time would not touch agate pebbles locally abundant "from a principle of superstitious veneration, as they are dedicated to the service of their magical invocations." Precious stones, therefore, were important factors in their religious life as the following uses indicate:

l. Objects of worship.—Among the pre-Colombian aborigines of Manta, Ecuador, a large emerald was worshipped, and rock crystal and jasper appear to have served the same purpose, respectively, among certain of the Peruvian and Ecuadorian tribes, until the Incan army forcibly showed them the error of their ways and they became sun worshippers. The Mixtecs worshipped a large jade at Achiuhtla, representing the god Quetzalcoatl. There is now at the University of Texas a meteorite from Wichita County, Tex., long venerated by the Comanche for extraordinary curative powers. It was known as *Po-a-cat-le-pe-le-corre* (Medicine Rock). In passing, all made votive offerings to it (Bolton, 1914, vol. 1, p. 296).

m. Fetishes and charms.—Rock crystal among the Natchez (Le Petit *in* French, 1851, pt. 3, p. 141) and the Pimas, nephrite among the Brazilian fishermen, sections of *Baculites* among the Cheyennes, turquoise among the Pueblos, and malachite among the Apaches, served as fetishes. Quartz crystals were used as charms by the Eskimo shamans, as was jasper, and the medicine men of the Tarahumara today use quartz crystals as charms (Bennett and Zingg, 1935, p. 369). Among the Yumas quartz crystals brought good luck.

n. Votive offerings to gods.—Turquoise among the Pueblos and Navahos, emeralds among the Chibchas of Colombia, emeralds and turquoise among the Incan Indians, and precious stones among the Tahus of Sinaloa, served as votive offerings. The Zuñi women ground corn and mixed it with powdered turquoise and white shell and offered it to their gods as food.

o. Temple incense.—Amber was used as incense by the Aztecs.

p. Means of divination.—Quartz crystal among the Pueblos and the Cherokees (Olbrechs, 1930, pp. 547–552), hematite among the latter tribe, obsidian and pyrite mirrors among the Aztecs and the Cakchiquels of Guatemala, and jade globes and rock crystals (Brinton, 1883, p. 245) among the Mayas, were used in divination. The Navaho medicine men use rock crystal in diagnosing disease by star-gazing, the light of the star being reflected in the stone permitting him to see the cause of the sickness of the patient like a motion picture (Wyman, 1936, p. 245).

q. Medicinal use.—Gypsum, ochres, and other minerals were used medicinally. Among the Tehuelche, a Patagonian tribe, "the new born babe is smeared over with damp gypsum" (Musters, 1871, p. 176), doubtless a reasonably good substitute for talcum. Powdered steatite was similarly used on Washoe and Yakut babes. Locally among the Colombian Chibchas the stomach of the desiccated corpse of the chief was filled with gold and emeralds before the body was wrapped in cotton and placed on a pedestal in a corner of one of their shrines. (Perhaps not medical, but interesting.)

r. Musical instruments.—Like the Chinese, the Venezuelan Indians knew the sonorous tones when thin plaques of nephrite are struck (Heger, 1925, pp. 148–155). The Pomo Indians of California also recognized the sound-producing qualities of minerals for they suspended two blocks of obsidian in the tree above which their deer traps were fastened. The struggling deer caused the stones to clash together, thus appraising the trapper of his success.

KNOWN SOURCES OF GEM SUPPLY

The maps of North and South America (pls. 4, 5) and list of mines operated by the Indians (p. 56) show the sources known to the writer from which the Indians obtained gems and ornamental stones. The list is markedly fragmentary for a number of reasons; principally because the mines, quarries, and placer deposits, abandoned for the most part centuries ago, have disappeared or become inconspicuous and also because much of the product sought by the Indians was of little or no value to the white. For the latter reason the list of pre-Hispanic quartz mines is doubtless much less complete than are the lists, for example, of emerald and turquoise. However, in spite of these difficulties, 289 Indian mines are listed.

Within the writer's knowledge of the archeology of the various areas and, taking into consideration the extensive territory occupied by the tribes and the relative mineral wealth thereof, it may be stated that the tribes with the widest knowledge of decorative stones and gems were the Mayas, the Pueblos, the Aztecs, the Mound Builders and the Indians of our southeastern States; a list including most of the more advanced peoples who were not only more ingenious than the average savage but whose higher civilization demanded a greater variety of raw materials. As miners, the Pueblos, Aztecs, Peruvians, and the Indians of the southern Appalachians were outstanding while the Mayas and Mound Builders depended largely on commerce for their supplies of gems.

THE INDIAN AS GEOLOGIST AND MINERALOGIST

The Indian, generally using tools of stone, by long experience became a fair geologist, knowing the rocks most suited to his needs and their characteristics—indeed, probably much better than we do. This required a knowledge of texture, hardness, and mineralogic make-up, so that he could recognize the same mineral if found in two different places. One mineral was good for pipes, a second for arrow points, and still a third for axes. The Indian's curiosity regarding minerals is shown by the presence in graves of mineral fragments apparently not valuable to him economically, such as zinc blende and chalcopyrite (Schenck and Dawson, 1929). Incidentally, the Indian mineralogist knew atacamite, sodalite, brochantite, pectolite, labradorite, dumortierite, hewettite, and variscite long before his European confrere.

One reason the Indian so frequently sought material for his arrowheads from stream gravel was that he realized that such material was fresh and did not shatter badly, as opposed to weathered material from surface outcrops or detrital boulders. Capt. G. F. Lyon (1825, p. 69), on his visit to Southampton Island, found both flint and agate pebbles on the beach, but the Eskimo use only the former, since the latter are prone to split along the banding. To obtain absolutely fresh arrow material, whether flint or obsidian, the Indian was at times forced to quarry, and, in quarrying, the partially weathered surface material was rejected. Similarly, the makers of catlinite pipes rejected all but a small part of the material quarried, for it had to be heat-resistant, of good color, and easily shaped. The Indian realized that soapstone absorbs and retains heat and that lamps or cooking utensils of it, once heated, gave up their heat slowly, keeping the oil fluid or the game cooking. The California Indians used the softer, more micaceous Santa Catalina steatite for pots and the closer-grained darker rock for weights of digging sticks, pipes, and ornaments (Schumacher, 1880, pp. 259–264). As the arrow-shaft straighteners were first heated, the Indian had to select for this use a mineral or rock resisting heat; soapstone and serpentine were common materials.

The Pomo Indians of California anticipated the modern petrographer's ideas as to quartz by differentiating obsidian into two distinct types, *bati xaga* ("arrow" obsidian), which was especially suitable for flaking, and *dupa xaga* ("to-cut" obsidian), which was harder, broke more cleanly, and was consequently, for instance, suitable for razors.

The first came from Lower Clear Lake, the second from Cole Creek (Loeb, 1926, p. 179).

The luminescence of rock crystal (q. v.) was known to the Pueblo Indians and it is not impossible some arrow maker of our own Southwest many centuries ago was the first to observe this property of minerals.

IDEAS AS TO ORIGIN OF PRECIOUS AND DECORATIVE STONES

The Indian normally accepted minerals unthinkingly, but in some instances an aboriginal philosopher tried to explain their origin. His results were reminiscent of those of his Greek prototype: Minerals were the direct gift of the Great Spirit (the Sauk and Fox idea regarding the galena of the Upper Mississippi Valley) or their origin was suggested by some striking physical property. Certain of the Indians of the north country saw in rock crystal a form of ice, as did the ancient Greeks and as do the modern Afghans; to the Mohawks, however, its glistening crystals were the congealed tears of a devoted mother, reminding us of a Greek myth as to the origin of amber. Sparks were derived from pyrite, therefore to the Point Barrow Eskimo it fell from the sky. Laminae of mica to the Delaware were scales of the mythical Horned Serpent. Catlinite from its color evidently was either stained by buffalo blood or was hardened human flesh. Again flint was associated with war and the chase; consequently to the Potawotomi, flint pebbles found here and there mark the sites of combat between an evil spirit and Nonaboojoo, "the friend of the human race" (De Smet, 1847; Thwaites, vol. 29, 1904–7, p. 376). Similarly, the silicified wood found on the mesas near the Grand Canyon, Ariz., was known to the Indians as the arrows of Shin-ar′-ump (Powell, 1875, p. 190). The brittleness of obsidian accounts for the Pomo Indians' explanation of the abundant fragments of the rock on Mt. Kanaktai, north of San Francisco Bay, Calif.; namely, that the obsidian-man, caught in a bush, in freeing himself fell and broke into thousands of pieces (Barrett, 1933, vol. 15, pp. 31, 220, 226, 231).

In instances the Indian was poetical, as is well exemplified in his legend of the origin of the iridescent obsidian which occurs with the ordinary obsidian at Glass Butte, Lake County, Oreg. To kill off a particularly venomous type of yellow jackets, the Indians surrounded the mountain and set fire to the forest.

> After the mountain had burned for several days there came up a shower having a beautiful rainbow. The rainbow shone all day on one spot on the south side of the Mountain and at evening seemed to enter the ground at this particular spot. After the fire they found that some of the mountain had melted and had made heaps of glass for their arrow and spear points, but the rainbow had settled into one heap and left the beautiful colors there.

This they called "rainbow" obsidian and used only for sacred and religious purposes (Forbes, 1935, pp. 307–309).

On the west shore of Lake Champlain near the falls, the waves throw well-polished flint pebbles upon the shore. The Mohawk companions of Fathers Pierron, Fremin, and Bruyas, in 1667, threw tobacco into the water offshore, so that the nimble little people living under the water would continue to furnish them with abundant material for their arrows (Donohoe, 1895, p. 103).

The medicine men of British Guiana teach that five classes of spirits direct the natural world and that each is represented by different stones (quartz, jadeite, etc.). Each neophytic medicine man is given two stones, representing the spirit and the spirit's wife, for his rattle. Provided the spirit is satisfied to be associated with the *piaiyen,* the stones breed and multiply, increasing the medicine man's powers in proportion as he has more spirits to assign to tasks or errands (Gillin, 1936, pp. 158–159).

THE INDIAN AS PROSPECTOR

The search for game and the need of roots, berries, and fruit as food made the Indian observant as to nature and kept him out of doors much of the time. Whether on a hunt or on the warpath, he was on the lookout for promising material for his arrows and his ornaments. Certain tribes, it will be remembered, were nomads and in a year's time covered a large area.

The Toltecs are reputed to have been great gem fanciers and Aztec tradition ascribes to the former their own knowledge of the art of working precious stones. The Toltecs attributed its invention to the god Quetzalcoatl (Biart, 1887, p. 325). The Toltecs were also reputed to be remarkable prospectors, for Friar Bernardino de Sahagún (1829–30, vol. 3, pp. 106–114) states:

> Their knowledge of stones was so great, that, even though these were hidden deep in the earth, they discovered them through their natural ingenuity and knowledge, and they knew where to find them. Their manner of making such discoveries was the following: They would get up very early in the morning and go up to an eminence and turn their heads toward the place where the sun had to rise; when it rose, they carefully looked in every direction to see in what place any precious stone might be hidden; they would especially look for them in places that were damp or wet, and particularly at the moment when it was rising: then a slight smoke would go up quite high, and there they found the precious stones under the earth or inside of another stone, whence the smoke would issue.

In instances, at least, the Indian recognized the value of mineral indicators, for on the Coppermine River, northern Canada, the local Indians dug for copper in the detrital deposits "wherever they observe the prehnite lying on the soil, experience having taught them that the largest pieces of copper are found associated with it" (Richardson, *in* Franklin, 1823, pp. 528–530).

The efficiency of the Indian as a prospector is conclusively shown by plates 4 and 5, on which are indicated, though admittedly incompletely, the sources of the Indian's supply of gems and decorative stones. Note how many of the soapstone localities of the eastern States were known to him and how well the mica belt of the Southern Appalachians is delimited. Petrographers searching for glassy phases of igneous rocks might well be guided by the Indian's obsidian mines while practically all of the known turquoise localities of our own Southwest and the emerald deposits of Colombia were worked by Indians in prewhite time. As to nephrite and jadeite, the aborigines had sources which are still unknown to their white successors.

Many mineral occurrences were shown the whites by Indians, and Indian or half-breed prospectors have played no mean role in discovering mineral deposits in the United States and Canada in the past five decades.

MINING METHODS[3]

The Indian's metal mining technique and his knowledge of smelting were inferior to those of the Greeks and Romans and probably those of the Carthaginians. As a gem miner, however, he was about as skillful as the Egyptian and Asiatic peoples, the great gem miners of the Eastern Hemisphere in classical times. To us his knowledge necessarily seems crude, but in fairness to the Indian it should be compared with the European knowledge of the early sixteenth century, a comparison considerably less disadvantageous to the Indian.

We are dealing with a mining industry in its infancy, and in consequence the major portion of the Indian's mineral products came from river gravel, although marine beaches, glacial moraines, and weathered outcrops furnished a second part and hard rock mining still a third. Predominantly, the Indian was a placer miner. George Catlin told G. E. Sellers (1886, p. 874) that the Indians considered chalcedony, jasper, and agate most easily chipped into arrowheads and the principal sources of their supply were "the coarse gravel bars of the rivers where large pebbles are found." It is not unusual for one side of an artifact to be a segment of a pebble; for example, the jadeite of the Aztecs and Mayas.

Alluvial mining for gems and ornamental stones presumably consisted largely of visual inspection and hand sorting. The rudiments of gravity concentration in gold placer mining appears to have been known to certain of the Indians of both North and South America (pl. 1) but it could rarely have had application in procuring gems and decorative stones. On one of the Aleutian Islands, however, amber occurs in a steep bank of friable material. "The natives spread a walrus-skin between two boats at the foot of the bank and dislodge the earth, which falls upon the skin and from this debris much amber is obtained" (Dall, 1870, p. 476).

It is by no means impossible that silicosis existed among the Indians, for the Yana arrowhead makers of northern California dreaded to breathe obsidian chips. They believed these caused many diseases and it was a function of the medicine man to "suck" out such fragments (Pope, 1918, p. 117).

Mineral deposits, being rare and unusual phenomena essential to the natives' well-being, appealed to the religious mysticism of the savage. Spirits guarded them and because of the savages' animalistic religious viewpoint, these spirits were often fearsome and might be assisted by birds of prey or hideous snakes. On the Red River near Lake Winnipeg, Verendrye, writing in 1729, tells us (1927, p. 46) there was "a small mountain, the stones of which sparkle night and day. The savages call it the 'Dwelling of the Spirit': no one ventures to go near it." Similarly, the salt springs of Syracuse, N. Y., through fear of their spirit, were not used by the Indian (for a western instance, see Irving, 1888, p. 74). Again, as the deposits were the property of the spirits, compensation must be made for minerals extracted,—a votive offering, perhaps of a little tobacco or a bracelet. The Indian was unwilling to discover his mines to the whites lest the spirits punish him and the Navaho Indians even invented terrifying tales to keep the whites from their garnet mines. Pedro Pizarro (1921, vol. 2, pp. 393–394) tells us that the "wizards" tried to keep the Indians from showing Lucas Martinez the mine of the Sun, an admonition successfully backed up by an eclipse of the sun followed by an earthquake. Wabishkeepenas, who in 1820 attempted to show Governor Cass and H. R. Schoolcraft the large mass of native copper near the mouth of the Ontanagon River, was kept by the spirits from finding it. So incensed were the tribesmen at him that he was cast out of the tribe and almost starved to death (McKenney and Hall, 1933, vol. 1, p. 349). We may surmise, however, that some Indians sensed that with the discovery of mines, whites would appear, with consequent unsettlement of the Indian system of economics.

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[3] Holmes, W. H. Handbook of aboriginal American antiquities. Pt. 1. Introductory. The lithic industries. Bur. Amer. Ethnol. Bull. 60. 1919.

Due to such beliefs, certain of the Indian miners, at least, and perhaps all, performed religious ceremonies to propitiate the spirits or gods before beginning mining. This was true of the aboriginal emerald miners of Colombia, of the Plains Indians in mining catlinite, of the California Indians in quarrying magnesite, and of the Eskimo in mining soapstone and jade. Sugar Hill, a California obsidian locality, was sacred ground, whose spirit the Pit River Indians feared to offend. The Oregon obsidian arrow makers abstained from water while making arrows; if a blade broke, in the making, the spirits were against the maker and the broken pieces were thrown away never to be touched again; if a maker showed anger, his punishment would be twice as severe; in consequence, he sang a hymn of praise to the spirits when he started to make another point (Forbes, 1935, pp. 307–309). Peter Martyr tells us that among the Indians of Veragua, Panama, gold was sacred and mining was preceded by fasting and penance. The Indians of Colombia only mined what placer gold they needed and any surplus was returned to the stream; if they took more than their need the "river-god would not lend them any more" (Sumner, 1907, p. 142). The Pueblos while gathering salt at Salt Lake, near Estancia, N. Mex., were required to be quiet, silent, and serious. "If they speak or laugh or make fun they will stand just where they are and die" (Benedict, 1931, p. 7). The Hopi, for 4 days prior to starting out for the Colorado

River to obtain rock salt, observed a taboo on sex relationship. The Pueblos of Isleta (Parsons, 1932, pp. 320–321) get their red paint from the Manzano Mountains to the east of their pueblo. Proper religious ceremonies soften the hard rock so that it can be scraped out with one's fingers. One must not take more than he needs or it will return to its pristine hardness. In the West Indies religious ceremonies preceded placer mining and the miner for 20 days before starting on his expedition observed strict continence or else he got no gold (Joyce, 1916, pp. 67, 243–245). The Caribs of British Guiana get their best clay for pottery from a small hill near the mouth of the Cuyuni and long journeys are made to it. All mining is confined to the first night of the full moon and by break of day the natives are on their way homeward with a big supply. Pots made from clay obtained at any other time break and transmit disease to those who use them (Schomburgk, 1922, vol. 1, p. 203).

Many of the aborigines had, however, passed beyond the first stages of mineral exploitation, that of hand sorting the valuable component from stream gravels, morainal material, and outcrops, and actually attacked the ores and precious stones in place either by open cuts or by underground workings. The Indian, indeed, did much quarrying, the open cuts, particularly of turquoise and obsidian, being extensive.

Before searching for gold in vein outcrops, the Panama Indians first burnt the grass, thus laying bare the rock.

The Indian hard-rock miner used in primitive form most of the elements of modern mining. He had as mining tools stone hammers and sledges, deer- or caribou-horn picks and wood (one end often being hardened by being charred), horn, stone, and copper gads. Knowledge of breaking rock by building a fire against it and then throwing water upon it appears to have been widely spread (Lake Superior, southwest Wisconsin, North Carolina, and other southern mica mines, Pennsylvania jasper mines, Arkansas novaculite mines, the New Mexican and adjacent turquoise mines (pl. 2), Mexico lode mines, etc.). This great invention was a logical one as many Indians must have noted that the boulders, upon which they built their fires were fractured when, for safety, the embers were quenched with water. Most of the workings are pits or open cuts with their greatest dimension following the strike of the deposit. From them certain gem-bearing beds were stoped (Tylor, 1861). From such open cuts also, in instances, winzes extended, there being aboriginal workings in the Los Cerrillos turquoise mine to points 100 feet below the present surface. Short tunnels occur in the North Carolina mica mines and in the Mineral Park, Ariz., and San Bernardino County, Calif., turquoise mines. In the aboriginal salt mine, 3 miles south of St. Thomas, Nev., certain galleries are reported to be 300 feet or more long (Harrington, 1930). In the placer mines of the Chuchiabo district, province of Callao, Peru, Pedro Sancho, Pizarro's secretary, states that some of the galleries were 40 brazas (about 240 feet) long (Means, 1917, pp. 163–165). In the ancient salt mine at Camp Verde, Ariz. (Morris, 1929, pp. 81–97) 4 or 5 different levels exist, each following a highly saline horizon. Two of these, 8 to 12 feet apart, are connected by a winze.

To carry out the product, hide and birchbark bags (Lake Superior copper mines and paint mines of Havasupai, Ariz.) were used and, in the Lake Superior open cuts, paddlelike wooden shovels for mucking have been found. In those mines, drainage was by ditching, supplemented by cedar troughs, and wooden bowls were apparently used to scoop out the water. The Havasupai of the Grand Canyon region, Arizona, obtain their red paint from a mine on Diamond Creek and to reach the portal on a cliff face they use ladders. A "chicken" ladder, a tree with its branches lopped off, was found in the old Lake Superior copper mines and another in Mammoth Cave. In the former district, too, rock pillars were left at one point and at a second the hanging wall was supported by huge granite boulders. There, also, great masses of native copper were raised by the use of levers and wooden props.

Certain features of lead mining by the Sauk and Foxes of the southwest Wisconsin lead district over 100 years ago are of interest although Indian methods may have been improved through intercourse with the whites (Meeker, 1872, pp. 271–296; History of Jo Daviess County, Ill., 1878, p. 836). There were then some 500 miners, largely women and old men for here, as opposed to most Indian mining, the able-bodied men were loath to mine. Some of the pits were 45 feet deep, the bottom being reached by a ramp. Ore and waste were removed by a mocock (a basket of birchbark or buckskin) which was dragged out by a rawhide rope. Rock was broken by the fire method. Drifts were run some distance into the side hills. The mining tools were originally buckhorns, but later European iron tools were introduced.

Normally, as little waste rock as possible was broken but, to get at plates of native copper in the Lake Superior region, the gangue on either side was, in places, removed and, in other open cuts, flint nodules were mined by undercutting. In turquoise mining in the Southwest, as the gem occurs as thin veinlets or small nodules, the ore was removed in blocks which were then carefully broken into small pieces to extract the gem. The ratio of waste to product was large. In mining gypsum in Mammoth Cave a circular area was cleared on the cave floor and the valuable gypsum sorted from the limestone waste (Pond, 1937, p. 178).

Most of the pits were sufficiently lighted by daylight but in Wyandotte Cave, Ind., mining was carried on over a mile from the cavern entrance. Flaming torches lighted the miners' work, as they did in the Camp Verde, Ariz., salt mine and the selenite deposit at Gypsum Cave, Nev.

On the Huallaga River, in eastern Peru, rock salt occurs in beds at the river's edge and the Indians make long canoe trips to obtain it. The overburden is first stripped and then trickles of water are led over the salt, which gradually dissolve their way to bed rock and the blocks are broken up into fragments of convenient size to carry away (Dyott, 1923, p. 130; Kerbey, 1906, p. 185).

That aboriginal mining had its major disasters is proven by the Pueblos' tales of miners, who were robbing pillars, being entombed in the New Mexican turquoise mines. The disaster is always brought on by an irreligious act either, according to variants of the tale, because of mining proscribed pillars or because a miner gave turquoise to his sweetheart, against which gift there was a taboo (Benedict, 1931, pp. 196–197, 236, 254). Alonzo W. Pond (1937) tells a dramatic story of an Indian gypsum miner trapped in Mammoth Cave. At Chuquicamata, Chile, in the pre-Hispanic pits, the mummified body of a woman was found, her head crushed by a fall of rock.

From the modern point of view, most of the open pits were small but, at Flint Ridge, Ohio; Magnet Cove, Ark.; Los Cerrillos, N. Mex., and Hidalgo, Mexico, the material removed must be measured in hundreds of thousands of tons. In the quartzite quarry, 125 miles north of Cheyenne, Wyo., Wilbur C. Knight (1898) estimates the tonnage of rock moved "by hundreds of thousands if not by millions of tons." The great majority of the mines listed (p. 56) were small-tonnage operations and most of them, at least, supplied the needs of a small number of primitive people. But also in Europe and Asia four centuries ago most of the mines were small operations.

"High grading" was feared at least in the Peruvian communal mining, for at the Chuchiabo gold placers, Pedro Sancho (Pizarro, 1917, 165) states "they [the caciques—S. H. B.] have taken such precautions in the matter that in nowise can any of what is taken out be stolen, because they have placed guards around the mines so that none of those who take out the gold can get away without being seen."

THE INDIAN'S KNOWLEDGE OF COMMERCIAL CHEMISTRY

The Indian knew something of chemistry; he burned limonite to produce red ochre for paint, gypsum was dehydrated to produce whitening, salt was obtained by evaporating sea water or saline spring water, and the Peruvian Indians smelted simple ores. The Kamia leached the salt-impregnated earth of Salton Sink and crystallized the salt out by boiling (Gifford, 1931, p. 4); this was done also by Indians of eastern Peru (Smyth and Lowe, 1836, p. 145), and by the Chibchas (Thompson, 1936, p. 120). A Potawatomi chief stated that their tribe had first noted elks drinking at salt licks: the Indians then tasted the water and, liking the flavor, boiled their meat and vegetables in it; finding this palatable "they boiled down the water in the manner that they had done the sap [i. e., hard maple sap—S. H. B.] and thus obtained salt" (Keating, 1824, p. 118).

The Tapuyas, of Brazil, made saltpeter by leaching earth containing it and then boiling the solution until the salt crystallized out (Warden, 1832, vol. 5, p. 209). Alunogen was used by the Navahos as a mordant.

THE EFFECT OF INDIAN MINING ON THE COMMERCIAL CONQUEST OF AMERICA

The hoarded mineral wealth of the Indians and the mines from which it had been obtained hastened to a remarkable degree the development of mining in America. Many of the earliest Spanish metal mines in Mexico and Peru were but further development of aboriginal mines. The natives' knowledge of the occurrence of gold, silver, emerald, and turquoise expedited mining development by many decades. Further, the primitive system of roads, the Indian trails, were followed by the white man in his exploration and conquest of the country.

INDIAN MINING LAWS

Usually the mine belonged loosely to the tribe in whose territory it occurred but in most cases working parties from other tribes could take what was necessary for their own needs. The mineral mined north of the Rio Grande, at least, was the personal property of the miner and he could use it or trade it as he saw fit (Gilmore, 1929, pp. 99–100; Weyer, 1932, pp. 174–176). In some instances, a valuable deposit for a time was sacred ground, open to all comers; for example, the Minnesota catlinite deposits (see p. 48), the Wisconsin catlinite deposits, and the blue clay of Blue Earth River, Minn., and probably the Obsidian Cliff obsidian (Alter, 1925, p. 381). Among the Pomo Indians of north-central California, the magnesite deposits and the obsidian quarries were operated, after proper votive offerings, by all the Indians of the region. Should hostile villages meet by chance at such places, their quarrels were forgotten; naturally, however, each had its own encampment and each party went about his business separately (Loeb, 1926, p. 194). Flint Ridge, Ohio, also is stated to have been neutral ground (Wilcox, 1934, p. 174). Neutral ground was not confined to mining for it is said that among the Araucanian Indians of Chile warfare ceased during the piñon nut season (Latcham, Jr., 1909, p. 341).

Such common use of mineral resources among the Indians probably originated through fear of angering the spirits of the mines. In certain instances, however, tribal rivalry existed as to the ownership of mineral deposits, and the Modak and Pit River Indians fought for the possession of the rich obsidian deposits west of Glass Mountain, Calif. Even monopolies existed in rare instances; for example, an old Natchez Indian alone made black marble pipes, nor did he permit his fellow tribesman to know the source of his raw product. For a common pipe he demanded "half the price of a blanket" (Schoolcraft, 1851–57, vol. 5, p. 692).

Gold, silver, and precious stones found in the Incan Empire were delivered as tribute to the Inca and he and his family wore them and also those nobles and captains he delighted to honor; they were used also in adorning the temples. "They were merely valued for their beauty and splendor" and were only mined when the Indians had no other work to do as "these were not things necessary for their existence." "Yet as they [the Indians] saw that these metals were used to adorn the palaces and temples (places which they valued so highly) they employed their spare time in seeking for gold, silver, and precious stones to present to the Ynca and to the Sun who were their Gods." (Garcilaso, 1871, vol. 2, pp. 21–22.) The Incan government, apparently with parental care, did not permit mining to be so extensively carried on by any individual as to injure his health.

TRADE

Due to less perfected methods of transport than our own, the stones used by the Indians were more likely to be of local origin than they are with us. In consequence, the source of precious stones was likely to be near its user's home—an aid in tracing its provenience but one to be used cautiously. Each tribe used the best stone his bailiwick afforded for the purpose required. A suitable mineral was much used by the tribe living where it occurred and from such centers gradually became less common until it disappeared where the limit of the local barter was reached. Conversely, if a region supplied no superlatively good material, for arrowheads, for example, the stones used might be of diverse origins. As the Indian liked variety and particularly brightly colored stones he was willing to barter articles of value for such as attracted his fancy. Much material from a distance was, however, used and, indeed, the Indians of the Argentine coast were wholly dependent on imports. In the first place, some of the tribes were nomadic and in tribal wanderings side trips were doubtless made to localities yielding desirable minerals. It is known that in 1680, a war party of Iroquois braves attacked tribes west of the Mississippi, distant from their New York home some 1,000 miles, and that other Iroquois war parties attacked the natives of South Carolina and of Lake Superior (Morgan, 1901, vol. 1, pp. 12–13). In some instances periodical trips were made for the particular purpose of procuring the desired material; we may cite the excursions to the pipestone quarry in Minnesota and the long wanderings of Eskimo after soapstone and other mineral substances. Roderick Macfarlane says the Eskimo "in singing and shouting boatloads" journeyed 400 miles to get flint from the quarries at Fort Good Hope (Stefánsson, 1922, p. 12; 1914, pp. 17–18). Again, by barter from tribe to tribe, some mineral substances almost traversed the continent until they found owners who treasured them too dearly to part with them. In the eighteenth century, Indians of the Northwest, even as far north as Montana, by intertribal barter possessed Spanish goods from New Mexico. Minnesota catlinite was carried as far as New York and Georgia; the Mound Builders had obsidian in quantity, probably obtaining it from the Yellowstone National Park (1,500 miles), mica and soapstone from the Appalachian Mountains (250 miles), and copper from Lake Superior (600 miles). New Mexican turquoise reached Mexico City and the Mayan cities, and Colombian emerald was so common in Peru that for at least two centuries after the Conquest it was known as Peruvian emerald. Certain tribes, for example, the Nez Percés, were outstanding as traders and over 100 years ago the Chippewas told William Cameron that they sometimes went as far as Virginia to barter Lake Superior copper for the products of the Atlantic coast (Fowke, 1888–89, pp. 402–403).

The Aztecs in particular, and the Mayas and Caribs to perhaps an almost equal extent, had a merchant class who journeyed far beyond the limits of their own countries. Colonel Church believes the Caribs traded along the seacoast of northwestern South America and the West Indies and probably in the entire Gulf of Mexico, including Florida (Church, 1912, p. 46). But the most interesting example of trade was the possession by the pre-Colombian Caribs, of the tiny island of Montserrat in the West Indies, of ornaments of amethyst, carnelian, jadeite, turquoise, rock crystal, chalcedony, lapis lazuli, nephrite, and cannel coal (Hodge, 1922, pp. 65, 75; Harrington, 1924, pp. 184–189). These semiprecious stones are all foreign to the island and strongly suggest that for their raw material the local Carib lapidaries were able to draw upon a number of different South American localities, certain of which must have been 2,000 miles away. Charlevoix, indeed, states that the Haitians have a legend that the green stones with which they hollowed out their canoes came from off the island and he specifies from the upper Amazon (Schomburgk, 1922, vol. 1, p. 264). C. F. P. von Martius also reports that West Indian Caribs spoke of their green stone amulets as "polished from the far-off continent" (Von Martius, 1867, vol. 1, pp. 731–732). [My attention was called to this reference by Miss Gladys C. Randolph.] The "trade trail" of nephrite along the Lesser Antilles to Cuba certainly suggests the South American origin of that stone. The materials reached the skillful Montserrat Island lapidaries unworked. Since many rocks and some minerals possess characteristics which indicate their source, it is suggested that petrographic examination of artifacts might throw much light on early American trade routes.

C. C. Jones (1859, p. 19) says that traditions then existed that arrow makers from the Georgia mountains in olden times left for the sea to trade their wares with the coastal peoples. Their avocation was honorable, they took no part in war, and were permitted to go wherever they pleased, being received everywhere hospitably. When, in 1584, Capt. Arthur Barlow and Capt. Philip Amados traded with the North Carolina coastal natives, they found the chiefs had precedence in the bartering and if they were present the commoner sort did not trade. When corn was ripe the Sioux arrived at the Hidatsa villages to trade and from "the time they came in sight of the village, to the time they disappeared there was a truce. When they had passed beyond the bluffs, they might steal an unguarded pony or lift a scalp and were in turn liable to be attacked" (Matthews, 1877, p. 27). In South America also, traders were permitted to traverse the country of their enemies in part because they carried with them the latest news (Im Thurn, 1883, p. 271).

Cabeza de Vaca could never have made his marvelous transcontinental trip had he not received fair treatment due to the commodities which he gathered and exchanged en route.

The wealth and variety of precious stones in the hands of the Aztecs was due in part from A. D. 1406 onward, according to Sahagun (1880, p. 547), to the Aztec traders who covered not only their own country but also penetrated the country of the surrounding tribes, traveling in the beginning of the sixteenth century as far south as Guatemala. As they had no beasts of burden, they packed their wares on their own backs, and it can be safely assumed that the cargoes they brought back with such difficulty to Mexico City were considered very precious. Owing to their familiarity with foreign tongues, these traders also served as imperial spies and frequently as the entering wedge of conquest.

As to when trade originated, we have no data but it presumably began soon after the Indians had stone artifacts. We can state, however, that it was well developed both in North and South America not long after the time of Christ (Coplico-Zacatenco culture, Mexico, the early Mayan Empire, Late Basket Makers, etc.).

In Mexico City, the Spaniards were surprised to find in the market a quarter given over to the goldsmiths who sold goldware and gem-set jewelry equal to or surpassing the handicraft of their Spanish contemporaries. Markets or fairs seem to have been held in many of the villages on set days which were attended not only by the people of the adjoining territory but by traveling merchants from afar. Bernal Diaz was greatly astonished "to see the vast number of people, the profusion of merchandise exposed for sale, and the admirable police system and the order that everywhere existed." Special magistrates held court and settled disputes on the spot; official weight-and-measure inspectors were present and falsification was severely punished (Joyce, 1914, p. 129–30).

The Mayas, particularly after they moved into Yucatan, inhabited a country without precious stones. However, they kept in commercial contact with their old home, the mountainous part of Central America, from which they got opals, presumably jadeite and probably other gem stones, but they doubtless obtained the majority of their stones by bartering with the Nahua peoples of Mexico. Indeed, in discussing the various articles used by the Mayas as currency, Cogolludo (1688, lib. 4., ch. 5) includes "certain precious stones and disks of copper brought from New Spain which they exchanged for other things." Spinden and Mason (Mason, 1926, p. 439) are convinced that they had emeralds from Colombia, although the writer has never seen an emerald in Maya jewelry. The Maya merchants, like the Aztec, traveled far and wide. Their gods were Xamen Ek, god of the North Star, and Ek-chuah, god of commerce, and to the latter when on the road they prayed nightly for safe return home. Much of their trade, like that of the Caribs, was doubtless by water as their canoes, manned by from 25 to 30 paddlers, made relatively long voyages. Columbus on his fourth voyage, in 1502, sighted such a trading canoe in the Caribbean off Bonacca Island.

For centuries, the Alaskan natives and those of northeastern Siberia have been in commercial contact. American soapstone, pectolite, and nephrite were traded with the Siberian natives (Kotzebue, 1821, vol. 3, p. 296). Alaskan nephrite is found in the ruins on St. Lawrence Island. On the other hand, Asian turquoise and amber (Weyer, Jr., 1929, p. 234) have been found in Aleutian graves.

GEMS MINED BY AMERICAN INDIANS

DIAMOND

Richard F. Burton (1869, vol. 2, p. 107) states that diamonds in Minas Geraes, Brazil, were "used it is said by the Indians as playthings for their children." While not susceptible of proof, the statement is not improbable because when the Portuguese first visited Brazil, the fact that the natives mined the associated alluvial gold was evidenced by their possession of gold fishhooks. From time to time an Indian hunter or miner must have been attracted by a diamond in a stream and picked it up, just as the Brazilian gold miners had done, prior to the recognition of the stones as diamonds in 1720. We may add that the fine diamond, "The Star of South Africa," was bought from an unsuspecting Negro sheepherder and that the Kashmir sapphires were used locally as gun flints—and they made good ones, too—before their true nature was known. It is probable that the Indians knew of at least some of the precious stones of Minas Geraes before the white man arrived, for Master Antonie Knivet, who was with Thomas Cavendish on his second voyage in 1591, says that at a village inland from Rio, the Tamoyes found "stones as green as grasse, and great store of white glistering stones like Christall, but many of them were blew and greene, red and white, wonderfull faire to beholde" (Purchas, 1905–6, vol. 16, p. 220). Still earlier, in 1572, due to information received from Indians, the Governor of Bahia sent Sebastian-Fernandez Tourinho on a long exploratory trip. In the hinterland, he found different colored precious stones and the Indians told him of the existence of other varieties (Warden, 1832, vol. 5, pp. 27, 71).

Travelers in British Guiana repeat a story, doubtless a myth, that some of the native manioc graters have inset in them small diamonds rather than quartz crystals (MacCreagh, 1926, pp. 276–279).

CORUNDUM (RUBY AND SAPPHIRE)

J. H. Howard (1936, p. 78) states that "Mr. Burnham S. Colburn, of Bellmore Forest, N. C., has in his gem collection a ruby bead found in a Cherokee Indian grave in western North Carolina." He apparently believes it to be of Indian workmanship and it may be noted that rubies occur in that part of the State.

At the Track Rock corundum mine, Union County, Ga., so named from an Indian pictograph nearby, blue and red detrital corundum is common. As the Indians spent considerable time in the vicinity, it is conceivable that they collected some of the brightly colored corundum (King, 1894, p. 133).

EMERALD

Emerald was used ornamentally by the Indians of Colombia, Venezuela, Ecuador, Bolivia, Peru, Brazil, and Panama (pl. 4). Among the Peruvian Indians under the Incas, the emerald (called *Umina*) was the king of gems, even the turquoise being "not so much esteemed by the Indians" (Garcilaso, 1688, pt. 1, p. 341).

The Colombian emerald mines had been worked by Indians an unknown but long time before the Spaniards conquered the country, the Chibchas working the Chivor-Somondoco mines, and the Muzos the Muzo and Coscuez mines. (Pogue, 1917, pp. 910–34; Pamphlet of Columbia Emerald Syndicate, 1921; Bauer, 1904; Olden, 1912, pp. 193–209; Benzoni, 1857, pp. 109–12; etc.) The Chibchas, being great traders, also distributed the emeralds mined by the less civilized Muzos (Veatch, 1917, p. 249). They bartered part of the emeralds with the tribes on the Magdalena below Neiva for gold (Joyce, 1912, p. 23). The Chibchas held fairs at which emeralds were featured, particularly that of Turmequé held every third day (Bollaert, 1860, p. 20).

So relentlessly did the conquistadores plunder the peoples of Ecuador and Peru that the large exports to Europe temporarily broke down the price structure of the emerald market. The fleet in which Father Joseph de Acosta returned to Europe (A. D. 1587) carried over 200 pounds of emeralds (Acosta, 1880, p. 226).

According to Joyce (1912, p. 42) emerald mining was inaugurated by religious ceremonies and was done in the rainy season, probably to take advantage of abundant water. Only the local Chibchas were permitted to dig at Somondoco and if a Chibcha permitted an outsider to do so, the former would die within a moon. J. Eric Thompson (1936, p. 120) states that the miners indulged in herbs causing them to see visions in which pay lodes would be revealed. The earth, excavated with pointed stakes, was washed in ponds, fed by deep-dug water ditches. W. H. Holmes (1919, p. 135) adds that the Colombian Indians also worked the solid-vein matter.

At the time of the arrival of the Spanish, emeralds in quantity were in the hands of the natives of northwestern South America and a few in those of Panama. The large number of emeralds in the hands of the Indians in the sixteenth century and their occurrence in old Indian graves in Peru and Colombia, support the thesis of a considerable age for the mines, as does the size of the pre-Hispanic workings at Somondoco. The Spanish chroniclers state that the keepers of the quipus said that Chimo Capac, a great chief of the Chimu period (perhaps 100 B. C.—A. D. 600) received emeralds among other tribute (Means, 1931, p. 64). William Bollaert (1861, p. 84), reports that the ruler or Scyris of the Caras, who conquered Quito about A. D. 1000, wore a large emerald, the hereditary emblem of his sovereignty. Further, Montesinos, a priest resident in America from 1628–42 (Montesinos, 1920, p. 94), states that emeralds were among the spoils of the Inca, Sinchi Roca, when he entered Cuzco in triumph after defeating the Chancas Indians (about A. D. 1100). It is stated that after Huayna-Capac conquered the Scyris he added to the *borla*, the insignia of Incan royalty, the emerald of the Scyris (Myers, 1871, p. 229). The mines are at least a thousand years old.

Recently S. K. Lothrop in his excavations at Coclé, Panama (1937, p. 186) found three emeralds; one, a pear-shaped double cabochon, was 1½ inches long and about 1 inch thick (189 carats), while a second weighed 112 carats. This is most interesting proof that the natives of Panama knew of the existence of emerald to the south as recorded by Francisco Lopez de Gomara (1749): "Some say that

Balboa received an account of how that land of Peru contained gold and emeralds."

Many archeologists believe that the Mayas and Aztecs possessed emeralds, but to the writer's knowledge no emerald artifact has ever been found in any of the Mayan or Mexican ruins. I feel that the "emeralds" mentioned by the followers of Cortes were fine jades. Now, however, that S. K. Lothrop has found emeralds at Coclé, in Panama, a city which had trade relations not only with South America but with the cities to the north, the possession of emeralds by these people becomes less unlikely. Molina (1571) gives as the Aztec name of emerald *quetzálitztli* (the stone of the brilliantly colored bird, the quetzál, *Pharomachrus mocinno*), an identification accepted by Pogue (1915, p. 109) and others (Squier, 1870, p. 246). I am inclined to believe, however, from Molina's description that this may well have been but a finely colored translucent jade.

While the South America lapidaries in some cases polished the stones into cabochon forms, they normally, like the Roman lapidaries, merely pierced the natural crystals so that they could be strung for necklaces or pendants. Emeralds in some instances were mounted by the Ecuadorian goldsmiths in gold jewelry.

BERYL

Beryl was not infrequently used by the Aztecs and it is one of the minerals mentioned in the Aztec Book of Tribute (Peñafiel, 1890, p. 79) as coming from the present State of Veracruz. It seems reasonable that some local Mexican source was known. It was used also by the Panamanians, Peruvians, and Brazilian Indians. At the Charleston Exposition in 1901, a crystal of golden beryl from an Indian mound, near Tessentee Creek, Macon County, N. C., was exhibited. It was 1½ inches in diameter and 2¼ inches long. Dr. G. F. Kunz stresses the fact that the Littlefield mine nearby produces fine aquamarines (1907, p. 45). D. B. Sterrett (1907, p. 799) reports that two beryl crystals were obtained from an Indian squaw at Lewiston, Idaho.

TOURMALINE

When the Mesa Grande, San Diego County, Calif., tourmaline deposits were found in 1898, it was reported that the Indians had long known of the deposit, a rumor substantiated by the occurrence of colored tourmaline crystals in Indian graves in the vicinity (Kunz, 1905, p. 23). The rediscovery of several deposits in the district was due to the Indians (Kunz, 1905, pp. 55, 56).

TURQUOISE [4]

Green and blue stones were especially valued by the Pueblos. (See p. 3.) They highly prized turquoise as an ornament, as a votive offering, and as a fetish; they decorated, in some instances, the lintels of their doors with it and used it as a measure of wealth and a means of investment. It may be added that the Navaho, to assist him in gambling, must needs have a fine piece of turquoise since Noholipi, the Gambling God in the Navaho origin legend, owed his remarkable winnings to a turquoise lucky piece (James, 1903, p. 150). Fray Geronimo de Zárate Salmerón (in New Mexico, 1618–26) says "to them it [turquoise] is as diamonds and precious stones" (Ayers, 1916, p. 217). In more recent times a string of turquoise fragments sufficient for an earring might well be worth the price of a pony (Blake, 1858, pp. 227–232). While Prof. J. S. Newberry (1876, p. 41) states that it was "so highly prized that a fragment of fine quality no larger than the nail of one's little finger and one-eighth of an inch in thickness was regarded as worth a mule or a good horse." He states that the Indians "discriminated accurately between the different shades of color" and were "not to be deceived by any base imitation." The value of turquoise beads was judged by the delicacy and purity of their blue color (Eleventh Census, 1890, vol. 50, p. 186).

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[4] For further data on turquoise, see Pogue, Joseph E. (1915).

The Pueblo Indians worked turquoise mines in our own Southwest at a number of places long before the Spanish arrived. Turquoise does not occur in ruins previous to those of the late Basket Makers and hence we can date the beginning of turquoise mining in the Southwest to about the fifth century (Roberts, 1929, p. 142). These people also apparently inaugurated the fascinating mosaic work of the Pueblo Indians. That the industry was an important one long before the discovery of America is shown by the many thousands of turquoise beads and pendants (30,000 in one room and 5,889 beads in a single burial) found at Pueblo Bonito, Chaco Canyon, N. Mex., dating from about A. D. 900 to 1100 (Pepper, 1909; Judd, 1925). It has furnished more turquoise ornaments than any other American ruin. George H. Pepper (1905, pp. 183–197) describes a turquoise pendant from Pueblo Bonito 3.4 centimeters ($1\frac{17}{50}$ inches) long and 2 centimeters ($\frac{78}{100}$ inch) broad at top and 2.5 centimeters (1 inch) at the bottom. A single mosaic cylinder 6 inches long and 3 inches in diameter was set with 1,214 pieces of turquoise. One can well agree (Pepper, 1920, p. 377) that the nearby Los Cerrillos mines must have been diligently worked by these people 1,000 years ago. John F. Blandy reported that in one grave near Prescott, Ariz., half a peck of turquoises worth $2,000 was recovered (Kunz, 1896, p. 910). Artifacts, indeed, suggest that over a thousand years ago the Pueblo peoples had greater wealth in turquoise than now and this opinion is strengthened by some of the Indian legends (Cushing, 1901, p. 385). Along the Salinas River, Ariz., ancient ruins are searched for turquoise after rains by modern Indians (Bartlett, 1854, vol. 2, p. 247). Turquoise is also prominent in the myths of the people of the Southwest

(i. e., the Zuñi, Pima, and Hopi), including the Navaho creation myth, suggesting the length of time it has been known to them. The extent of the commerce in turquoise in the sixteenth century is further proof that the mines were relatively old.

The most famous of these old turquoise mines, that at Los Cerrillos, N. Mex., the Tewa Indian place-name for which is the equivalent of "the place where turquoise is dug" (Harrington, 1916, p. 492), was reworked by the Spaniards until 1686, when the workings caved. From the size of the Cerrillos open-cut and of its dumps (pl. 2), and the large trees thereon, some of the latter being considered to be 600 years old, a considerable age for these pits is indicated. George H. Pepper, judging from country rock attached to some of the Pueblo Bonito turquoise pendants, is satisfied that Los Cerrillos was the mine from which they were obtained. In 1540 the Indians at the head of the Gulf of California told Captain Fernando Alarchon that the Pueblos dug the turquoises "out of a rock of stone" (Alarchon *in* Hakluyt, 1904, vol. 9, p. 300). Los Cerrillos workings have been described by many geologists. (Blake, 1858, pp. 227–232; Newberry, 1876, p. 41; Silliman, 1881, pp. 67–71; Kunz, 1890, pp. 54–59; Johnson, 1903, pp. 493–499; Sterrett, 1911, pp. 1066–1067, 1071.) Rather extensive ancient workings occur all over Mt. Chalchihuitl and on Turquoise Hill, 4 miles distant. Modern mining on Mount Chalchihuitl, according to Silliman, broke into open stopes in which were many stone hammers, some to be held in the hand and others grooved for handles. One of 20-pounds weight had the scrub-oak handle still attached by a withe. He adds that fire was used in breaking the rock. Sterrett says the "main pit on the northwest side of the hill" is "about 130 feet deep on the upper side and about 35 feet deep on the lower side, the rim is about 200 feet across and the bottom nearly 100 feet across. The large dumps of waste rock removed from this are about 150 yards long by 75 yards wide and from 1 to 30 feet deep. These dimensions do not correspond closely with those given by the earlier writers since this would give the dump an area of less than 2½ acres as compared with some 20 reported by Silliman." It does, however, suggest the removal of some 100,000 tons of rock. Silliman mentions aboriginal open chambers in solid rock, 40 feet long, and he states that at places modern mining has encountered aboriginal workings to depths of at least 100 feet. W. P. Blake says that 75 years ago it was visited by Indians from a distance and the Indians continue to this day to get turquoise at this mine. Although this mine is undoubtedly old, the Zuñi tale of the migration of the Turquoise Man and the Salt Woman suggests that, before the discovery of Los Cerrillos, turquoise was obtained from some mine farther north (Bunzel, 1932, pp. 1032–1033), possibly from the locality of La Jara, Colo.

There are also ancient Indian turquoise mines (Pogue, 1915, p. 55; Snow, 1891, pp. 511–512; Lindgren, Graton, and Gordon, 1910, p. 324; Zalinski, 1907, pp. 464–465, 474) presumably of pre-Columbian age in the Burro Mountains at several localities, on Hachita Mountains, and Jarilla Mountains (Hidden, 1893, pp. 400–402), Sierra County, near Paschal, N. Mex.; Sugar Loaf Peak, Lincoln County (anon., 1897, vol. 64, p. 456) and Crescent, Clark County, Nev. (Lincoln, 1923, p. 19; Vanderberg, 1937, pp. 24–25); Turquoise Mountain, Cochise County; and Mineral Park, Mohave County, Ariz. (pits and 20-foot long tunnels) (Blake, 1883, pp. 199–200; Mining and Science Press, 1902, vol. 85, No. 11, p. 102; Crawford and Johnson, 1937, pp. 511–522); Manvel, and Silver Lake, San Bernardino County, Calif., and near La Jara, Conejos County, Colo. (Kunz, 1902, p. 760). Several of the Burro Mountain localities known to white miners were discovered by evidence of aboriginal workings. The presence of charcoal indicates the use of fire in breaking the rock, followed by hammer work. The larger rock fragments were broken into small pieces in the search of turquoise. The stone hammers are "of rounded form, 4 to 8 inches or more in diameter and were evidently used without a handle" (Zalinski, 1907, vol. 2, pp. 464–465). Pits were sunk to a depth of 20 feet at least. Fire was also used at Turquoise Mountain, Cochise County, Ariz. Prehistoric turquoise mines occur over a large area in northwestern San Bernardino County, Calif., Manvel being one of the chief centers (Kunz, 1905, pp. 12, 107–109, 152–153; 1899, p. 580). Stone hammers and crude pottery occur in the old pits while pictographs are common in the vicinity. The pits, which occur in an area 30 or 40 miles in diameter, are from 15 to 30 feet across and up to 18 feet deep. Malcolm J. Rogers (1929, pp. 1–13) states that in the Silver Lake district, San Bernardino County, Calif., the pits occur in an east and west line 8 miles long and that short drifts were driven from the main pits.

The aboriginal trade in the turquoise of the Southwest (pl. 4) was widespread, extending from the West Indies and Yucatan on the south to Ontario on the north (New York Times, September 20, 1895) and from California on the west to Mississippi and Arkansas on the east. About 1527, Alvar Nuñez Cabeza de Vaca obtained turquoise from his Indian patients on the Rio Grande, Tex. The men of Hernando de Soto (A. D. 1542), when they arrived in the province of Guasco (eastern Arkansas), found in the possession of the Indians "Turkie stones—which the Indians signified by signes that they had from the West" (Purchas, 1905–7, vol. 18, p. 46). In a grave in Coahomo County, Miss., 100 turquoise beads and a small turquoise pendant were found (Peabody, 1904, vol. 3, p. 51). As glass beads were also found in the grave, this commerce with the Pueblos of the Southwest continued after the white man reached America. Vicente de Saldivar Mendoza in 1599 met, near the Canadian River in the vicinity of the present Texas-New Mexican line, a band of Apaches who had been trading for turquoise ("some small green stones which they use") with the Picuries and Taos pueblos of New Mexico (Thomas, 1935, p. 7). Agustin de Vetancurt writing between the years 1630 and 1680 says the Apaches visited the Pueblo of Pecos to trade for *Chalchuites* (1870–71, vol. 3, p. 323). Among the Apaches, precious stones had a directional symbolism: white shell, north; jet, east; turquoise, south; and catlinite, west.

When Sieur Perrot (1911, vol. 1, pp. 363–364; LeRoy, 1753), arrived among the Fox and Sauk in 1683, he was informed that the latter had visited lands to the Southwest where they met Indians coming from that direction whence they had brought "stones, blue and green, resembling the turquoise which they wore fastened in their noses and ears." They had also seen mounted men resembling the French, that is, the Spaniards of New Mexico. Twenty-one years earlier Radisson claimed that the Crees of the Lake Superior region had beads of "a stone of Turquoise" as nose ornaments which they obtained by barter from the "nation of the buff and beefe" (Burpee, 1908, p. 216). Malcolm J. Rogers (1936) states that a piece of turquoise was reported from a Wisconsin Indian site.

Jean Ribault (1875, p. 177) claimed that the French got turquoises from the Florida Indians in 1562 but his mineralogy may have been faulty or the material may have been derived from Spanish wrecks.

That turquoise, *Xiuitl*, was known to the Aztecs in early time is proved by the name of their God of Fire and Water, Xiuhcoatl ("The Turquoise Snakes") (Verrill, 1929, p. 185). Turquoise was rather commonly used by them, and also at the time of the Spanish occupation by the Indians of Sinaloa, Sonora, and Chihuahua. The latter certainly got theirs from our own Southwest, largely by barter with the Pueblos, although perhaps in part in mining excursions which they, themselves, may have made. A Franciscan friar (probably Fray Juan de la Asuncion) in 1538 found turquoise among the Indians of Northern Mexico which they got as day laborers' pay from the Pueblos to the north (Bandelier, 1890, p. 86) and the next year Friar Marcos de Niza repeats the statement. In consequence, at that time New Mexican turquoise in quantity was in the possession of at least the northern Mexican Indians and as, in the ruins of Pueblo Bonito sherds of Toltec pottery have been found, trade between our Southwest and Mexico is indicated even 1,200 years ago (Coolidge, 1929, p. 216). While the gem does occur in Mexico at several localities, none of the deposits are important and no aboriginal workings are known, although the Aztec Book of Tribute and the statement of Sahagun (1880, p. 77) that it was found in the "mines" indicate without much doubt that the Aztecs had Mexican sources of turquoise. Turquoise is said by Lorenzana to have been worked at Tollan, the capital of the Toltecs, about 1325 (Blondel, 1876, p. 294). In short, the Aztecs and their predecessors, the Toltecs, probably got their turquoise largely from New Mexico and Arizona but in part from local sources now undiscovered or exhausted. It appears to have been available in smaller pieces to the Aztecs than to the Pueblos and particularly was used as thin plates in mosaic work. Its treatment suggests its high value and possibly its foreign source.

That the Mayas had at their command considerable quantities of turquoise is shown by the 3,000 pieces set in the mosaic plaque found by Earl H. Morris at Chichen Itza in 1928 (1931, pp. 210–221). The turquoise, doubtless, was largely of New Mexican origin.

Turquoise was a popular and relatively common gem among the Peruvian Indians. It was also used by the natives of Montserrat, West Indies; Bolivia; Colombia; Ecuador; Argentina; and Chile. Indeed A. Hrdlička, in 1910, found a turquoise bead at Miramir, Argentina, on the Atlantic Ocean, 270 miles south of Buenos Aires. The natives of Ecuador had some fair-sized pieces of turquoise, a partially worked bead found on the Island of La Plata being 2½ inches long and 1½ inches in diameter (Dorsey, 1901, p. 266). No aboriginal South American mines are as yet certainly known but the gem occurs at certain places in the Andean regions of Peru, Argentina, and Chile. A suggestion as to a source is obtained from the name, Copiapó, which owes its origin, according to the Indian tradition to the great quantity of turquoise found in its mountains (Molina, 1809, p. 64). Further turquoise has recently been identified in the Chuquicamata copper deposit in Chile and as this mine was extensively worked by the Indians and as turquoise artifacts are found in the immediate vicinity, this was doubtless a source.[5]

D. Jenness found a turquoise bead some years ago in an ancient Eskimo grave on one of the Diomede Isles in Bering Strait, which he judged to be of Chinese origin from etchings on it.

GARNET

Garnet was used by the Pueblos, although it appears to have been one of the later stones known, as it has not, to the writer's knowledge, been found in Cliff Dwellers or Basket Makers ruins. Fray Gerónimo de Zárate Salmerón, who served in New Mexico from 1618–26, in his account of his missionary work states that in the Pueblo of Picuris (Taos County) "are garnet mines," a garnet locality known to this day (Ayer, 1916, p. 217). Today the Navahos collect the gem from their reservation as do other Arizona Indians from several localities, obtaining the gem both from the desert sands, from ant hills, and the source rock (Kunz, 1890, p. 80).

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[5] Personal communication, L. W. Kemp.

Of doubtful correctness is the reported occurrence of garnet in Mound Builders graves (Shepherd, 1890, p. 103).

The Comanche Indians collected garnet at Jaco Lake, Chihuahua, Mexico (Bauer, 1904, p. 360) and it was commonly used by the Aztecs and was known to the Peruvian Indians.

Don de Ulloa and Don George Juan, Captains of the Spanish Navy, who traveled in Peru in 1734 (Pinkerton, 1808–14, vol. 14, p. 550) state that "rubies" are found in a river near the village of Azogues in the vicinity of Quito. "Indians wash them recovering pieces as big as a lentil and sometimes larger. . . . But the inhabitants, content with this piddling work, do not trouble themselves to trace the origin of the mine."

OLIVINE

The Navahos collect from their reservation olivines which occur with garnets in the desert sands. That the pre-Columbian Pueblos possessed olivine, I cannot definitely state, although they probably did (Winship, 1896; James, 1920, p. xv). Olivine and bronzite are incidental constituents of meteoric iron found in Ohio Mound Builders mounds (Shepherd, 1890, p. 101).

LAPIS LAZULI

Lapis lazuli was possessed by the Indians of Montserrat Island, Peru, Bolivia, Ecuador, and Chile (pl. 4). One of the largest pieces of lapis lazuli known (24 x 12 x 8 inches) was found in a Peruvian grave (Farrington, 1903, p. 202). Lapis lazuli is at present mined in Chile. By the Peruvian Indians, it was called *huinzo*.

SODALITE

Sodalite was used by the ancient Peruvians and by the Indians of Bolivia, Ecuador, and Argentina. Lapis lazuli, or more probably sodalite, was common at Tiaguanaco, Bolivia, where pounds of worked chips may be picked up, some as large as one's hands (Uhle, 1903, p. 95). In 1928 Fr. Ahlfeld (Ahlfeld and Wegner, 1932, pp. 288–96; Ahlfeld and Mosebach, 1935, pp. 388–414) found old workings for sodalite on the northern part of Serrania of Palca on the East Cordillera of Cochabamba, Bolivia. The mineral occurs as veins in a dike of nepheline syenite cutting Devonian sandstone. The works consist of open cuts and tunnels, the largest of the latter being 300 feet long and 16 feet high. The Jesuits worked the deposits after the Indians abandoned them, the earliest workings being pre-Inca. Microscopically and chemically the sodalite resembles that of the Inca artifacts (Brendler, 1934, pp. 28–31).

LAZULITE

Lazulite was used by the ancient Peruvians and Bolivians.

OPAL

The fire opal of Mexico was known to the Aztecs. There is now in the Field Museum of Natural History, Chicago, a head of the Mexican Sun God carved in fire opal, probably the work of an Aztec lapidary. Since the sixteenth century, it has been in European collections, and was one of the gorgeous gems owned by Philip Henry Hope. *El Aguila Azteca* ("the Aztec eagle") is a lovely Mexican opal weighing cut, evidently by an Aztec lapidary, 32 carats. It is carved in the form of an eagle's head and is reported to have been found about 1863. It is said once to have belonged to Maximilian (anon., 1937, pp. 97, 99, 101). Snr. Garcia (1936, p. 559) reports the finding of worked opals in the mountains southeast of Lake Chapala near Jiquilpan, Michoacan. The accurate word picture of the opal in Sahagun's Nahuatl text descriptive of Aztec lapidary work (Seler's trans. *in* Saville, 1922, p. 33) is well known.

Wm. T. Brigham (1887, p. 256) states that the Quiches, a Mayan tribe, in pre-Spanish times, used noble opals from Honduras commonly in their jewelry. The Mayas also had hyalite.

W. Reiss and A. Stübel (1880–87, p. 29 and pl. 80) recovered relatively large pierced opal beads from the Ancon, Peru, ruin. The mineralogic determination was by Prof. H. Fischer, of Freiburg.

Common opal was known to the Indians of British Columbia, Washington, Oregon, Wyoming, South Dakota, California, Panama, Brazil, and Argentina and to the Pueblos, Mayas, and Aztecs. That used in Oregon or Washington in part is, or approaches, gem quality.

DISTRIBUTION OF QUARTZ GEMS

Rock crystal and quartz, jasper and chalcedony were used by practically all tribes. Agate was known to the Indians of British Columbia, eastern Canada, the North Atlantic States, Virginia, the Mississippi Valley, the northern plains, the western mountains, the American Pacific coast, and the Pueblos. It was also used by the Aztecs, the Mayas, and the Peruvians and the Indians of Costa Rica, Panama, Colombia, Bolivia, British Guiana, Chile, Argentina, and Brazil. Carnelian artifacts have been found in Georgia, Illinois, the western mountain States, California, Oregon, and Washington, and among the Pueblo ruins. It was used by the Aztecs and the Mayas and the Indians of Costa Rica, Panama, Montserrat Island, Lesser Antilles, Colombia, Venezuela, Ecuador, British Guiana, and Brazil. In certain Colombian graves, as many as 8,000 beads, largely carnelian, have been found together with pebbles of carnelian, suggesting a stream origin. Such beads are readily sold to the present-day Indians living to the east, and a brightly colored one may be worth a mule. The local source is not sufficient for today's demand and beads are actually imported from Germany to satisfy it (Mason, 1936, pp. 212–216).

In North America amethyst was used by the Eskimo and by the Indians of eastern Canada, the southeastern States, the upper Mississippi Valley, and California, and by the Pueblos and Aztecs. It was also used by the aborigines of Costa Rica, Panama, Montserrat Island, the Lesser Antilles, and Peru. Smoky quartz was used by the Eskimo, the Indians of Newfoundland, Rhode Island, the southeastern States, upper Mississippi Valley, Colorado, Washington, Oregon, and California, and the Pueblos and Peruvians. Other species of quartz were used as follows: Moss agate (Saskatchewan, New York, southeastern States, Wyoming, Colorado, Texas, Utah, California, Oregon, and the Pueblos); rose quartz (New Jersey, Maryland, Virginia, Georgia, South Dakota, Aztecs, and Brazil); gold quartz (Georgia, California, and Arizona); citrine (Georgia, upper Mississippi Valley, and Dakota); prase (Pueblos and Aztecs); bloodstone (Oregon, Aztecs, Panama, and Peru); chrysoprase (Peru, Colombia, and perhaps California); iris (Mound Builders); Aventurine quartz (Aztecs and Mayas); plasma (Aztecs and Panama); and onyx (southeastern States and Washington).

AMETHYST

The Aztecs had some amethyst of fine color; finer, I am inclined to believe, than that of any of the Mexican sources we now know. Sahagun (1880, p. 771) mentions Aztec amethyst mines.

ROCK CRYSTAL

Quartz was doubtless obtained largely in river, marine, and glacial gravels but pits were sunk on quartz veins in New England, New York, and in the Appalachian Mountains of Virginia and North Carolina and it must have been a byproduct of mica mining. Quartz was, indeed, quarried at many places in the Piedmont region of the southeastern States, but since here, as elsewhere, it occurs so frequently as pebbles, gravels were the main source (Holmes, 1897). Master Alexander Whitaker, minister to Henrico Colony, Virginia, writing in 1613 (Purchas, 1905–7, vol. 19, p. 112) says that 12 miles above the falls on the James River is "a Christall Rocke wherewith the Indians doe head many of their arrows." When Albert de la Pierria founded Beaufort, Fla., about 1563, the Indians brought the Frenchmen presents of "pearls, crystals, silver, etc." In 1587, the Frenchmen of Charles-fort were given by the chief, Ovade, pearls, fine crystal, and silver ore said to come from 10 days' journey inland (Georgia probably) where "the inhabitants of the countrey did dig the same at the foote of certaine high mountaines where they found of it in very good quantitie. Being joyfull to understand such good newes and to have come to the knowledge of that which they most desired" the Frenchmen returned to their fort (Laudonniere, 1904, pp. 481–482). When John Verarzanus, a Florentine writing in 1524, states that the Florida natives were the possessors not only of crystal but also of turquoise, we become skeptical of his mineralogic attainments (Hakluyt, 1850, p. 106).

The Hot Springs, Ark., rock crystal locality was as well known to the Indians as to present-day mineralogists. Rock crystal and arrowheads made of it are common in Arkansas Indian graves. In Cavelier's account of La Salle's voyage, he says "about 50 leagues from the spot where we were [mouth of Rio Bravo, Tex.] were two or three mountains on the banks of a river from which were taken red stones as clear as crystal," possibly a distorted reference to Hot Springs (Shea, 1861, p. 28).

Father Gravier (1900, pp. 138–141) in his voyage on the Mississippi in 1700 "found in a small basket," in a temple in the village of the Taensas, a subtribe of the Natches Indians, "a small piece of rock Crystal."

The Navahos are stated to light their ceremonial fire from the sun by means of crystal (Curtis, 1907, p. 53). The Pueblo Indians of the upper Rio Grande during their rain ceremonies beat the drum to imitate thunder, and rubbed together pebbles of white quartz to produce an incandescent glow simulating lightning (Jeancon, 1923, p. 68). At Pecos, New Mex., A. V. Kidder (1932, p. 93) found a cylinder, set in a rectangle with a shallow groove into which the cylinder exactly fitted, both of white vein quartz. The cylinder is about 3 inches long and 1½ inches in diameter. Knowing that "lightning sets" still were used in religious ceremonies at San Ildefonsa, that night he rubbed the cylinder in the groove and finally the stones "became visible in a strange pale glow which flickered and died for all the world like distant lightning." Here we have a perfected machine perhaps 700 years old; the first Indian to observe the luminescence of quartz must have done so centuries earlier.

The Hopi used rock crystal in religious ceremonies, as well as in divinition (Fewkes, 1898, p. 730; 1904, pp. 107–109). It was also used in the religious ceremonies of the Zuñi, being, for example, placed on certain fraternal shrines, and by other Pueblos it was used to reflect the sun into kivas and into medicine bowls. Rock crystal was used in diagnosing disease both by the Pueblos (White, 1932, p. 110; Parsons, 1932, p. 285) and the Pima (Parsons, 1928, p. 459). Rock crystal is a common charm among the Yuma Indians (Forde, 1931, p. 196). The Australian medicine man paralleled his American confrere in many uses of rock crystal in the curative art (Goldenweiser, 1922, pp. 105–107).

According to a Shasta legend, a long time ago there was in the East a white and glistening firestone like the purest quartz. The coyote brought this to the Indians, and thus fire originated (Bancroft, 1886, p. 547). Quartz was supposed by the Chippewas to protect its owner against thunderstorms as the thunderbird would no more hurt it than a hen "the egg she has laid" (Densmore, 1929, p. 113). The most prized possession of the Cherokee medicine man was a rock-crystal-like mineral once embedded in the head of the Horned Serpent so prominent in Iroquois mythology. It was invaluable in treating the sick and foretold which of the braves should shun certain raids as their deaths were shown by it to be probable (Oldbrechts, 1930, pp. 547–552). Among the Ojibways white flint was called *mik kwum me wow beek*, or ice stone and as the name was also doubtless applied to rock crystal, it parallels the Greek from which our word crystal is derived. Similarly certain Alaskan Eskimo believe rock crystals are the centers of ice masses so solidly frozen that they become stone: they are, therefore, prized amulets (Nelson, 1899, p. 446). A Mandan medicine man, among other wonderful performances vouched for by white witnesses, could roll a snowball in his hand "so that it at length becomes hard, and is converted into a white stone, which when struck emits fire" (Maximilian, 1843; Thwaites, 1904–07, p. 342). Near the village of Lansingburgh, N. Y., is Diamond Rock, a mass of Quebec sandstone containing innumerable quartz crystals which glitter in the sunlight. According to Mohawk tradition, these are the joyful tears of a devoted mother upon her reunion with a wandering son (Sylvester, 1877, pp. 207–220).

Sahagun (1880, p. 771) reports that the Aztecs had crystal mines and Clavigero (1807, p. 16) states that these come from the mountains on the Gulf coast between Veracruz and Coatzacualco River, that is, those of Chinantla and the Province of Mixtecas.

The present-day medicine men among the Yucatan Indians pretend that they can see hidden things with the aid of rock crystal, and it is successfully used in the diagnosis of the ills of their patients (Mendez, 1921, pp. 173–174). When Hans Stade was about to be eaten by his eastern Brazilian captors, an old woman of the tribe shaved off his eyebrows with a rock-crystal razor (1874, p. 63). The Venezuelan Indian lover must shape for his beloved, as a betrothal gift, a cylindrical bead of rock crystal to be worn around her neck (Spence, 1878, vol. 1, p. 81). Spruce (1908) emphasizes the far-flung trade in rock crystal along the Amazon.

AGATE

Agate adorned the central mountain where, according to the Navaho creation myth, their tribe was created. The pebbles in the rattle of the Guiana medicine man are agate (Bancroft, 1769, p. 311).

JASPER

In Bucks, Lehigh, and Berks Counties, Pa., there are some nine groups of jasper quarries. A depth of at least 14 feet was attained. Fire was used in quarrying. A tree in the bottom of one pit shows the quarries must at least antedate 1680–90. At one place almost 40,000 cubic yards were excavated (Mercer, 1894, pp. 80–92; Deisher, 1932, pp. 334–341). Jasper was also quarried in Chester and Lancaster Counties, Pa. Flint Ridge, in Licking and Muskingum Counties, Ohio, is the site of aboriginal flint quarries, affording also jasper and chalcedony, which cover an area 2 miles square. In the cavities of the flint are quartz crystals up to 1 and 2 inches across. They vary from limpid to almost black. The pits are up to 80 feet in diameter. Fire and water were used to supplement the stone hammers (from 6 ounces to 20 pounds in weight) in breaking up the rock (Wilson, 1898, pp. 868–871; Fowke, 1888–89, pp. 517–520).

Sahagun (1880, p. 771) mentions Aztec jasper mines. Clavigero (1807, p. 16) states that jasper was quarried in the Mountains of Calpolalpan, east of Mexico City. R. H. Schomburgk (1846, pp. 28–29) states that jasper resembling verd antique is obtained by the Arecunas Indians from Mount Roraima on the Caroni River and is not only used but is traded to other tribes.

CHALCEDONY

Jasper and chalcedony occur as nodules in the quartzite of the Converse County, Wyo., quartzite quarry and were a byproduct of quarrying there (Dorsey, 1901, pp. 237–241).

CHRYSOPRASE

Near the California chrysoprase localities on Venice Hill, Tulare County, are depressions which D. B. Sterrett (1909, pp. 753–754) seems inclined to believe are aboriginal pits.

IRIS

Among the Mound Builders artifacts found at Mound City, Ross County, Ohio, were arrowheads of "transparent or hyaline quartz which from the brilliant play of colors upon their fractured surfaces are real gems" (Squier and Davis, 1847, p. 213).

AGATIZED WOOD

Agatized wood was used by the Indians from Oregon and Wyoming southward to Yucatan, Mexico.

The Petrified Forest, near Adamana, Ariz., was, to the Indians and particularly to the Pueblos, a source of agatized wood, amethyst, smoky quartz, and other members of the quartz family. Agatized wood was traded well out into the plains and southwest far into Mexico. Charles F. Lummis (1892, pp. 20–27; 1925, pp. 109–121) believes the Indians made special trips to gather chips from the shattered tree trunks. Agatized wood was used by the Basket Makers, but as neither they nor the Cliff Dwellers are known to have had either amethyst or smoky quartz, intensive exploitation of the Petrified Forest perhaps did not long antedate the coming of the Spaniards. Among the Arizona Indians, it was called *Shinarump*. Agatized wood, chalcedony, and other quartz minerals were also obtained by the Pueblo peoples from a "petrified forest" 25 miles south of Chambers, Ariz., on the Sante Fe Railroad (Roberts, 1931, p. 5). The agatized wood used by the Wyoming Indians was presumably of local origin, as sources are numerous in the West.

Artifacts of silicified or agatized wood are found also in Florida, Mississippi, Arkansas, Texas, and the upper Mississippi Valley. More or less beautifully silicified fossils were also rather widely used (silicified coral, New York, southeastern States, upper Mississippi Valley and Pueblos; shark's teeth, southeastern States; *Baculites*, Kansas; shells, Mound Builders, Pueblos, and Mayas; and crinoid stems, Pueblos). On account of their forms they were in high repute as charms.

DISTRIBUTION OF JADE

Jadeite was commonly used by the Aztecs and other Mexican tribes, the Mayas, all Indians of Central America, the West Indians and the Peruvians; it was also used less commonly by the Eskimo and British Columbia Indians, the Mound Builders, the Pueblos, and the peoples of British Guiana, Ecuador, and Brazil (pl. 4). Nephrite was commonly used and highly prized by the Eskimo and the Indians of British Columbia, Venezuela, Colombia, Ecuador, and Brazil; it was also known to the Indians of Oregon and Washington, the Pueblos, the Aztecs, Mayas, the ancient Costa Ricans, and the Indians of Montserrat Island, Cuba, and the Lesser Antilles, and of Argentina and Chile. The single occurrence known to me among the Peruvian Indians is reported by Uhle in the Ica Valley. It was also probably known to the Haitian Indians (pl. 4). Jade was early used by the American aborigines. A jadeite tablet found in Guatemala bears in Maya numerals the date equivalent to A. D. 60, while a Maya statuette from Veracruz has the date corresponding to 98 B. C., by the Spinden correlation. The latter has been usually considered nephrite but more recently was determined to be jadeite (Washington, 1922, pp. 2–12). The annals of the Cakchikels Indians of Guatemala, a Maya tribe, stated that jade was used as tribute in the second of the four Tulans from which the four clans came. The researches of F. W. Clarke and G. P. Merrill (1888, vol. 2, 115–130) lead them to believe that all the Alaska jade is nephrite while that of the ancient Mexicans and Mayas is largely jadeite although nephrite also occurs.

Nadaillac and Moorehead report jade in Mound Builders' mounds and jadeite is reported by Putman from a mound of these people in Michigan. (Putnam, 1886, pp. 62–63; W. Moorehead, 1917, p. 20; de Nadaillac, 1884, pp. 107–109.) This is most interesting, proving the extent of tribe by tribe barter, while suggesting, if we let our imagination run riot, a more direct commercial connection with the Mexican civilization or, via Florida, with that of the West Indies. Jadeite, while in the possession of the northern Mexican Indians (Chihuahua), was exceedingly rare among the Pueblos although A. V. Kidder and S. J. Guernsey (1919, p. 148) report a jadeite pendant in a Cliff House Ruin in northeastern Arizona. These authorities know of no other occurrence of jadeite in the Southwest, although it is also reported from Casas Grandes in Chihuahua. Nephrite also was very rare among the Pueblos although a small round tablet from Cochise County, Ariz., made of "an impure variety of nephrite" has been found (Holmes, 1906, p. 108). Warren K. Moorehead (1910, vol. 2, pl. 51) states that a jade effigy of a fish was found in a Pueblo ruin near Mesa, Ariz. Julian H. Steward (1937, p. 72) found a nephrite scraper in a cave on Promontory Point, Salt Lake, Utah. As much Southwestern turquoise reached Central Mexico and Toltec pottery occurs in the ruins of Pueblo Bonito, it would appear natural that jade would have been obtained from the south, particularly as the Pueblo peoples were passionately fond of green stones. The situation is perplexing. Did the Pueblos have a taboo against jade or was its export from Mexico northward prohibited by tribal decree? It reminds one of the rarity of amber among the Egyptians and early Mesopotamian peoples. Strangely enough, the Pueblos depended largely on local sources for their precious stones.

JADEITE

Jade (largely jadeite) was used early by the Mexican peoples. According to Toltec chronicles, Chimalman, the mother of the king Quetzalcoatl Chalchiuitl (about A. D. 839), became pregnant from swallowing a *chálchihuitl* (jade) (1886, vol. 5, p. 257). In the advice of a Toltec father to his son, the gods listened to the prayers of the wise men of old, "because they were of a pure heart, perfect and without blemish like Chalchihuitl" (Charnay, 1887, p. 179).

Jade (*chalchihuitl* in part; the term also covers turquoise and other green and blue stones) was highly prized by the Aztecs, and Father Sahagun says they could only be worn by the nobles or ruling classes. To show that the Aztecs valued it highly, I need but to remind you that when Montezuma and Cortes gambled, the native chieftain first paid his debts in gold but on the second night he promised the Spanish marauder something much more precious; this, to Cortes' disgust, proved to be four small carved jade beads. Montezuma had valued each one at two loads of gold, although I do not remember that the size of the load was specified. That it was relatively abundant among them is shown by the fact that Dr. H. M. Saville in 1900–1901 excavated the site of an ancient Aztec temple in Mexico City, and found therein over 2,000 jadeite objects.

It is not unusual for Aztec and Central American jadeite carvings to retain on the reverse side a segment of the original pebble from which it was cut. The jadeite was evidently of alluvial origin. Friar Bernardino de Sahagun says *chalchihuitl* was found in Mexico. Mrs. Zelia Nuttall, from a close study of the Aztec tribute rolls (1901, pp. 227–238) in which jadeite is listed as the tribute of certain towns, concluded that the material was obtained from a number of places in southeastern Mexico, the country east of a north to south line drawn through Mexico City, Chiapas, and Guerrero being particularly likely sources. Almost a generation thereafter her predictions were verified by discoveries of jade in Zimapan (Davis, 1931, p. 182) and as pebbles in rivers in Oaxaca and Guerrero (Caso, 1932, p. 509).

Jadeite was the most precious of Mayan possessions, and its ownership an insignia of wealth or power. A piece of jade was put in the mouth of the dead, curiously analogous to the Chinese custom. The Mayas had jadeite in relatively large pieces as some pectoral plaques of it are 6 inches square. In March 1937, the Carnegie Institution reported that Dr. A. V. Kidder had found in a pyramid mound near Guatemala City a water-worn boulder of jade 16 inches in diameter and weighing nearly 200 pounds. This beautiful light-green jade is certainly one of the largest ever found in America. A highly polished sphere of jade 1$\frac{7}{16}$ inches in diameter, once used as a conjuring stone, was found at Chichen-Itza in 1928 (Morris, 1931, p. 210). Mayan jade, in part at least, was derived from stream gravels, for at Copan, Honduras, a human figure was engraved on one side of a pebble 8 inches long, the reverse distinctly showing its pebble form (Gann, 1926, p. 183). Guatemala and Costa Rica are likely sources in addition to trade with Mexico. H. J. Spinden (1913, p. 145) reports that some of the jades found at Monte Alban, Mexico, appear to be of Mayan workmanship, and were doubtless obtained by barter with the Mayan merchants. In later times, the Mayans were supplied with jadeite not only from Guatemala but also from Mexico. Thomas Gann (1925, p. 274) states that jadeite artifacts were more common in the early days of the Old Empire than in the later days of that era or in those of the New Empire, suggesting, perhaps, the partial exhaustion of a local alluvial source. The conclusion appears probable as in late Mayan times some of the artifacts are patently cut from larger ornaments of an earlier date.

Jadeite was widely used in Costa Rica, although it is much less common in the highland than in the Pacific coastal graves (Hartman, 1901, p. 171). At Las Guacas, Nicoyan Peninsula, Costa Rica, jadeite occurs more abundantly than anywhere else in the American continent, the finds being numbered by hundreds. Included in them are partially worked pebbles and unworked blocks. The Nicoyans cut jade cleverly and had a considerable trade in it both to the north and south. A stream source must be nearby (Hartman, 1907, p. 85).

NEPHRITE

Lt. J. C. Cantwell in 1884 heard of nephrite on the Kobuk River, Alaska, but the natives through superstitious fear of the mountain refused to guide him to the mine. Lt. George M. Stoney, however, in 1886 found the aboriginal nephrite mine at Jade Mountains on the north side of Kobuk River (1900, pp. 56–57). His Indians refused to visit the place for fear they might not return as "only the medicine man could visit it and then not until after a long fast" (Stoney, 1900, p. 56). Shungnak, the local Eskimo name for jade, is given to one of the tributaries of Kobuk River (Smith and Mertie, 1930, p. 345). In addition to jade in place, the pebbles of the rivers of the region were doubtless collected by the Eskimo. The natives also collected nephrite boulders occurring in the Fraser and Thompson Rivers, British Columbia, and on the high benches of the Fraser River (Camsell, 1912, p. 606), on the beaches of Puget Sound, and in southern Oregon. Nephrite boulders also occur on the upper Lewes River, Yukon Territory, not far from the eastern boundary of Alaska (Dawson, 1887; 1888, p. 186) and on the Rae River in the Coronation Gulf region (Jenness, 1925, p. 432) although we do not know that these sources were exploited by the Indians. Nephrite was used by all the Eskimo of Alaska, and they often made long journeys to procure it. By barter it had reached the Eskimo of the west coast of Hudson Bay and Baffin Island as early as the "Thule stage of culture" (say A. D. 600–1600) (Mathiassen, 1927; 1927 a, pt. 2, p. 27). Nephrite artifacts are found also in the Eskimo ruins of Newfoundland (Jenness, 1932). In consequence, the finding of an axe supposed to be of jade at Balsam Lake, Ontario, is not surprising (Laidlaw, 1897, p. 85; 1897 a, vol. 19, p. 69).

Indeed, jade was traded in all along the northern Pacific coast; the British Columbian sources furnishing material for the coast from the Straits of Juan de Fuca to Bering Bay and Jade Mountain, from the Aleutian Islands to the mouth of the Mackenzie River (Emmons, 1923). Of the various stone amulets, jade was the most valuable and among the Eskimo the stone had magical properies. A small bead was worth six or seven foxskins. A small adz blade among the Tlingits was worth two or three slaves and while a Tlingit was using it, his wife refrained from frivolity lest the blade break. The Tlingit name was *tsu* (green), a close approximation to the Chinese *Yu*. The British Columbian father handed a nephrite tool down to his son as a priceless heirloom. Among the Salish Indians it was called Stoklait (green stone).

The material of the jade (nephrite) ornaments in the possession of the British Guiana Indians is said by the natives of San Carlos to come from the source of the Orinoco River and by the Indians of the missions of the Caroni and of Angostura from the headwaters of the Rio Branco. The two localities are near one another (de Humboldt, 1814–29, vol. 2, pp. 395–402, 462). Tubular beads and labrets of this material were an object of barter through much of Brazil and British Guiana. Such are reported to have been used "as current money (Keymis, *in* Hakluyt, 1904, vol. 10, p. 491). Sir Walter Raleigh (1595) reported that the tribes of the Amazons traded jade ornaments for gold and the English exported them to England to cure kidney diseases as early as 1604 (Pinkerton, 1812, vol. 12, p. 283).

That the alluvial nephrite locality of Amargoza, Bahia, Brazil, was worked by the Indians seems probable from the abundance of nephrite artifacts in that region.

MINERALS AND ORNAMENTAL STONES MINED BY AMERICAN INDIANS

ACTINOLITE

Actinolite, or a rock largely composed of it, was a material for axes prized by the ancient Hopi and Zuñi (Hough, 1903, p. 322). It was also used by the California natives.

CHLOROMELANITE

Chloromelanite tools were particularly used by the Mayas of Guatemala, and by the ancient people of the Valley of Mexico and the State of Guerrero (Hodge, 1922, vol. 3, p. 47). It is presumably of local origin. It was also used by the pre-Spanish Colombians and Chileans.

PECTOLITE

From a pale greenish or bluish slightly translucent pectolite, the Eskimo of Point Barrow make hammerheads. Both pectolite and jade are called *Kaudlo* and are said to come "from the East, a long way off" (Murdoch, 1892, p. 60; Clarke and Chatard, 1884, p. 20). The Alaskan natives traded pectolite with the natives of Siberia. It was also used by the British Columbian Indians.

SERPENTINE

Serpentine was used by practically all Indian tribes.

STAUROLITE

While the writer has not been able to definitely prove the report, it is probable that the Indians of Virginia used the local staurolite as an ornament. Such a striking mineral, and one so locally abundant could scarcely have escaped their notice.

MAGNESITE

The Pomo Indians obtained magnesite at White Buttes, near Cache Creek, and at Sulphur Bank, Clear Lake, Calif. This was made into beads and baked, in which process the color changes from white to an attractive buff or salmon color. As elsewhere stated, this served as money and was traded from the coast to the Sierra Nevadas (Kroeber, 1925, p. 249; Loeb, 1926, p. 178). The magnesite of the Pueblo Indians may also have been of California origin. It was also used by the Indians of British Columbia.

ALABASTER AND STALACTITIC CALCITE

Alabaster was used by the Indians of Canada, the North Atlantic States, Georgia, the Mississippi Valley, the Rocky Mountains, California, Cuba, Puerto Rico, Ecuador, Colombia, Bolivia, Brazil, Argentina, and Chile, and by the Pueblos, Aztecs, Mayas, and Peruvians.

The Indians found that Wyandotte Cave, Crawford County, Ind., contained two desirable products, a jaspery flint and stalactites of satin spar. They carried on mining a full mile within the cave, lighting their labor with flaming torches. From the lenses of flint protruding from the limestone walls they hacked flint flakes, with granite hammers, and also cut from a giant stalactite some 1,000 cubic feet of glistening alabaster. The imprints of their moccasins were still visible on the floor of the cave 80 years ago. They also dug down from the surface in one place until the cave formation was encountered and mined alabaster open cut. Deer antlers were used as picks in this work. (Fowke, 1922, pp. 108–109; Blatchley, 1897, pp. 156, 165–169; Mercer, 1895, pp. 396–400.)

The Aztecs quarried at Tecali, in Puebla, Mexico, what we now call Mexican onyx, and what they called *tecali*, probably derived from *teocali* or "lord's mansion" (anon., 1891, p. 729). It was widely used for images and vases and as windows in their temples (Fortier and Ficklen, 1907, p. 190).

GALENA

The brilliant luster of galena appealed to the Eskimo, the Indians of British Columbia, Canada, Florida, the upper Mississippi Valley, Virginia, Mississippi, Utah, the Yavapai Indians of Arizona, and the Pueblos. The Wisconsin-Iowa-Illinois lead district was known to the Indians before the white man's arrival and Nicolet (1634) and Radisson and Groseilliers (1658–59) were told of the deposits. Miami Indians brought to Perrot upon his arrival in the region in 1684 "lumps of lead" found, they said, in rock crevices (Neill, 1858, p. 139; Carver, 1778, pp. 47–48). While the writer agrees that smelting was taught the Indians by the French, he cannot agree with those who state that mining was taught them by the French as galena is widely and abundantly present in the prehistoric mounds of the upper Mississippi Valley. When, in 1810, two St. Louisianians, Colonel Smith and Mr. Moorhead, purchased the Wisconsin-Iowa-Illinois lead fields from Augustus Choutou, the Sauk and Foxes ran them off the property. Fearing the effect of this action on the American Government, the tribes at once sent delegates to Governor Howard and General Clarke at St. Louis, who stated that "when the Great Spirit gave the land to the Red Men, their ancestors, he foresaw that the White Men would come into the country and that the game would be destroyed; therefore, out of his great goodness he put lead into the ground that they, their wives and children might continue to exist" (Bradbury, 1904, p. 253; Lanman, 1856, vol. 1, p. 25). This was doubtless the principal source of the galena so abundant in certain mounds of the Mound Builders. There is also evidence that the Indians obtained galena from the outcrops of the southeast Missouri mines (Thwaites, 1904–07, vol. 26, p. 95). Probably the Tri-State district was known to the Indians for they informed Lieutenant Wilkinson "that the country to the northwest of the Osage village abounds with valuable lead mines" (Coues, 1895, vol. 2, p. 561). John S. Newberry (1892, p. 191) states that near Lexington, Ky., the Indians sank a trench over 300 feet long and from 10 to 12 feet deep on a galena-barite vein. He adds that "trees growing in the trench show it to be at least 500 years old." The Blue Bell Mine, Kootenai County, Idaho, is said to have been discovered by the whites owing to the fact that the Indians made bullets by smelting its galena (Laut, 1918, p. 89). It is by no means certain, however, that this particular discovery by Indians is very ancient. F. M. Endlich near Cook's Peak, N. Mex., in sinking a shaft broke into an old stope in which were stone tools and none of metal (Chapin, 1892, p. 30).

Galena, found as pebbles on the sea beach of Coronation Gulf, is used by the local Eskimo to blacken skins (Stefánsson, 1913, p. 443).

HEMATITE

Hematite was used by Eskimo, the Indians of Canada, many tribes in the United States, the Aztecs, Mayas, the old Panamanians, and Peruvians, and the Indians of Cuba, Venezuela, Bolivia, Ecuador, Brazil, and Argentina. Hematite was mined at Marquette, Mich., and at Iron Mountain, St. Francois County, and at Leslie, Franklin County, Mo. At Leslie, white miners have opened up an open cut in iron ore, 150 feet long, 100 feet wide, and from 15 to 20 feet deep. Honeycombing the area mined and extending beneath its deepest part are tortuous winzes, the work of Indians. Most of the openings are narrow and sinuous but some permit of a man standing up in them. Over 1,000 rude stone implements, all grooved and from 1 to 5 pounds in weight, were found in and around the workings. The material sought was soft hematite used as paint although solid hematite for implements and some flint were byproducts (Holmes, 1904, pp. 723–726). The Hopi got hematite for ceremonial pigment from Cataract Canyon, 110 miles west of the Hopi Reservation (Hough, 1902). The Peaux de Lièvre Indians got hematite near Fort Good Hope on the Mackenzie River. From its appearance they called it *Sa-ts-anne* or "bear's excrement" (Chambers, 1914, p. 284).

AZURITE AND MALACHITE

Malachite was used by the Indians of Arizona and New Mexico, by the Aztecs, Mayas, and Peruvians and by the Indians of British Columbia, eastern Canada, Ecuador, Colombia, Bolivia, and Argentina. Azurite was used by the Pueblos, Eskimo, the Mayas, and the Indians of Bolivia, eastern Canada, San Domingo, and Chile. According to Apache belief, a small bead of malachite attached to one's gun makes it shoot straight (Bourke, 1892, pp. 588–591).

The Pueblo Indians had many sources of these minerals. Apparently a squad from Oñate's expedition (1598) inspected a shaft three "estados" (about 16 feet) deep from which these minerals were obtained (Bolton, 1916, p. 244) either in the Aquarius or Hualpai Ranges. In Father Geronimo Zarate Salmeron's account of the same expedition, the blue used as paint in the Zuñi province and the green from Xémez, where "whole cargoes could be gathered," were also presumably oxidized copper ores (*in* Bolton, 1916, p. 269). The Hopi got malachite for ceremonial pigment from Cataract Canyon, 110 miles west of the Hopi Reservation (Hough, 1902). Copper carbonates were obtained for pigments by the Pueblos in the elevated region west of Luna, New Mex. (Hough, 1907, p. 59).

SMITHSONITE

Smithsonite was ornamentally used by the ancient Peruvians and probably by the Pueblos.

ATACAMITE AND BROCHANTITE

Beads of both these copper minerals have been found in Chile, near their source, the Chuquicamata mine. Atacamite was also used by the Peruvian and Argentina Indians, and brochantite by the Bolivian Indians.

CHRYSOCOLLA

Chrysocolla was popular among the old inhabitants of South America, artifacts of it being found in Peru, Bolivia, Chile, and Argentina. It was obtained at Quebrade de Cobres, northwestern Argentina, by the Diagüites. Among their workings is a 45° inclined shaft 30 meters deep (Beuchat, 1912, p. 715). It was also used by Indians of California and Arizona.

PYRITE

Pyrite was rather widely used in both North and South America. It is not unusual for Maya pyrite mirrors and the firestones in Eskimo graves and those of the Maine Red Paint People to be altered to limonite, a possible scale of the rapidity of pyrite alteration.

In Labrador, northern Canada, and Alaska, the Eskimo used pyrite to strike fire as did the Indians of northwest and northern Canada and Newfoundland. It may be mentioned that the Aleutians to obtain fire strike together two flints rubbed in sulfur, the spark falling on lint powdered with sulfur which is obtained from the nearby volcanoes (Dall, 1870, p. 370). At Point Barrow, the Eskimo miners believe the pyrite, which occurs massive and as spherical concretions, to have fallen from the sky and hence it is called "firestone" (Ray, 1885, p. 46; Murdoch, 1892, p. 60; Hough, 1890, p. 574). Among the Cumberland Bay Eskimo snapping a whip with a piece of pyrite at the tip drives away evil spritis (Boas, 1907, p. 138). These people believe that some seals break a breathing hole through the ice with a stone held under the flipper. A hunter, if he kills such a seal, should, without looking at the stone, throw it over his shoulder, which changes it into pyrite and thereafter insures good luck in sealing (Boas, 1907, p. 152). The Iglulik Eskimo protect themselves from thunderstorms by laying out an amulet consisting of pyrite, a piece of white skin, and a small kamik sole (Rasmussen, *in* Weyer, 1932, p. 182, footnote). The Haneragmiut Eskimo procure pyrite for fire-making to the northwest of Coronation Bay and trade this to the Copper Eskimo (Stefánsson, 1919, pp. 74, p. 113).

It is common in the Mound Builder mounds of Ohio, that of the Muskingum Valley presumably coming from the adjoining hills where pyrite abounds. In 1826 an English traveler, Ash, found in a mound what from its luster he believed a large lump of gold. His laborers carefully covered up their work and secretly in a private room gave it the fire test. Their "gold" turned "black, filled the place with a sulfurous odor and then burst into 10,000 fragments" (Mitchener, 1876, pp. 24–25).

Pyrite was used extensively by Aztecs as inlays in their mosaics, as eyes for their statues, and, well polished, as mirrors. Zelia Nuttall (1901 a, p. 83) believes that pyrite mirrors were used in the sun-cult, to concentrate the rays of the sun and so light the sacred fire at noon on the days of the vernal equinox and summer solstice. Crushed marcasite was used as a face powder by certain Aztec priests (Bancroft, 1886, vol. 3, p. 340).

Don George Juan and Don de Ulloa (traveled, 1734) refer to ancient aboriginal mines of pyrite in Peru (Pinkerton, 1808–14, vol. 14, pp. 545–546). Pulverized pyrite was among the votive offerings to the gods.

The natives of Tierra del Fuego who, like the Eskimo, used iron pyrite for fire-making, obtained it from at least two mines known to us; one on the northern part of Tierra del Fuego Island and another near Mercury Sound, Clarence Island (Cooper, 1917, pp. 191–192). As its use to produce fire is noted as early as A. D. 1580, it was doubtless a pre-European custom (Lothrop, 1928, p. 64). The Fuegians prize it highly. Their neighbors, the Patagonians, not only used it for making fire but weighted the globular hide bags at the end of their bolas with it. Presumably they obtained it from the Fuegian country (Fitzroy, 1839, vol. 1, p. 62).

CANNEL COAL, JET, AND LIGNITE

Cannel coal, lignite, and jet were rather widely used by the North American Indians including the Aztecs and Mayas as well as by the Indians of Montserrat Island and Ecuador. These were used mainly as ornaments, although certain of the Pueblo people, the Assiniboin and other Northern Plains Indians, used it to a minor degree as fuel.

The Indians of Blennerhasset Island, W. Va., used to a considerable extent for pendants cannel coal which they procured locally (Hodge, 1922, p. 151).

Cannel coal adorned the northland in the Navaho Creation Legend. Jet occurs in Colorado and lignite widely in the Southwest, and their outcrops furnished abundant material to the Pueblo peoples. They mined lignite for fuel purposes 15 miles north of Holbrook, Ariz., and at Kokopuyama, northeastern Arizona (Hough, 1903, pp. 334, 335).

MICA

Mica was used by the Eskimo and the Indians of British Columbia, eastern Canada, the United States east of the Mississippi and California, by the Pueblos and Aztecs, and the Indians of Panama (paragonite), San Salvador, Peru, Ecuador, Venezuela, and Argentina.

Mica (largely muscovite) was mined by pits at many points in the Appalachian uplift from Alabama north-northeast to the St. Lawrence. It was an article of trade west as far as the Mississippi and south as far as Florida. Rock crystal and the more unusual pegmatitic minerals, often vividly colored, must have been occasional but prized byproducts. The Indians of North Carolina carried down some of their mica pits as far as surface weathering extended, that, is to ground-water level. Some of the pits were from 40 to 50 feet wide and from 75 to 100 feet long and, though in part filled up, are still from 15 to 20 feet deep. One North Carolina mica pit is 320 feet long and in places 30 feet deep (Smith, 1877, pp. 441–443). Old tunnels connecting pits from 50 to over 100 feet long are mentioned. They are from 3 to 3½ feet in height and much less in width. Large trees have grown within the pits. When the North Carolina mica boom was on in 1868–69, such pits were of value in relocating mica mines and the Indians proved to have been good prospectors (Kerr, vol. 1, 1875, pp. 300–301; 1880, p. 457). Incidentally the mountaineers were obsessed with the idea that the ancient pits were silver mines worked by De Soto's men (Foster, 1873, p. 370). D. B. Sterrett (1907, p. 401) found stone tools around some of the North Carolina mica mines and Wm. B. Phillips (1888, p. 662) states that the Indians used fire in breaking the rock. The latter reports that large pine trees (18 inches in diameter) have grown on the debris of the Alabama mica mines (Phillips, 1907, p. 671). Mica mines occur in 7 different counties in Alabama and at some 17 localities in North Carolina (Holmes, 1919, pp. 244–245). The old traveler Laudonniére (A. D. 1564) was shown by Indians large mica plates found in the Appalachians with "christal" and "slate stone." Ralph Lane (A. D. 1585–86) heard also of a "marvelous and strange mineral" occurring in large plates, which was mined to the west of Roanoke (Packard, 1893, pp. 162–163). In Amelia County, Va., there are aboriginal mica pits 12 feet deep (Fontaine, 1883, pp. 330–339). Fire was used to break the rock.

Mica was commonly used by the Mound Builders, and J. Priest (1838, p. 179) mentions one piece, 3 feet long, 1½ feet wide, and 1½ inches thick, a fair sized "book." From a single mound, as many as 250 mica objects and as much as 20 bushels of mica have been reclaimed. It doubtless came from the Appalachian mines. "Synthetic" pearls were made by the Mound Builders by wrapping a coat of mica around wooden beads (Davis, 1931, p. 136). Again, beads of clay were covered with crushed mica (Lilly, 1937, p. 210).

Among the Delaware Indians, mica laminae are placed in medicine bags and are powerful "rain medicine" as they are believed to be scales of the great mythological Horned Serpent. Merely place a few "scales" on a rock beside some stream and the black thunder clouds gather and refresh the thirsty cornfields with rain (Harrington, 1913, p. 226).

Fuchsite beads are reported from an ancient Guatemalan grave (Bauer, 1900, p. 291).

LABRADORITE

Labradorite, which was introduced to the scientific world by Moravian missionaries in 1770, was presumably procured by them from the Eskimo, who still bring fine specimens from the interior of Labrador (Packard, 1891, pp. 272–283). They know it as "the fire-rock" (Browne, 1909, p. 155). Captain Cartwright, who was in Labrador from 1770–86 (Cartwright, 1911, p. 347), mentions it being picked up by the Eskimo. Eskimo chiefs used it ornamentally over 50 years ago (Tuttle, 1885, p. 65).

Anorthite was used in Panama.

SUNSTONE

Dr. H. P. Wightman states that the Apache Indians collected sunstone (variety *andesine*) from their reservation not far from Globe, Ariz. (Sterrett, 1916, p. 322).

MOONSTONE

Moonstone was among the gems excavated at Ticoman, Mexico, in a grave of Toltec or pre-Toltec culture (Vaillant, 1930, pp. 610–616).

AMAZONSTONE

Amazonstone was used by the Aztecs, Mayas, and the Indians of Wisconsin, California, Trinidad, Venezuela, and Brazil.

SLATE

The Haidahs, skillful carvers in slate, obtained the raw product from a quarry on Queen Charlotte's Island.

VARISCITE

Mr. Don Maguire, according to Dr. G. F. Kunz, reports that in the vicinity of the variscite locality near old Camp Floyd in Cedar Valley, Utah, artifacts and rock inscriptions are common. No old workings have as yet been found, however, but variscite was used by the ancient Pueblo people of the region.

CALAMINE

Calamine of predominant blue color, but in part gray and green, is possessed by the Yaquis of Chihuahua, Mexico. They use it as votive offerings, believing it has magical qualities (Sterrett, 1909, p. 812).

FLUORSPAR

Fluorspar was used as an ornamental stone by the Indians of Missouri, Illinois, Tennessee, Kentucky, Indiana, and California, the Pueblos, Aztecs, and Peruvians, and the Bolivian Indians.

The fluorite used by the Mound Builders was probably picked up from the outcrop as E. C. Clark[6] knows of no aboriginal pits in the Illinois-Kentucky field. He states that most of the fluorite employed by the Mound Builders apparently came from the Illinois part of the field.

AMBER

Amber was commonly used by the Eskimo and the Indians of Alaska and British Columbia, the Aztecs and Mayas, the Peruvians and the Indians of Santo Domingo and the Lesser Antilles and Colombia. A fossil gum was also used by the Brazilian Indians and a fossil resin closely resembling amber has been found in Mound Builder mounds in Ross County, Ohio. Reported occurrences of amber artifacts in Virginia and Tennessee may or may not be authentic.

The Eskimo of Point Barrow find from time to time amber on the beach and use it rough as amulets and rarely cut it into beads. It is called *aúma*, i. e., "a live coal," a descriptive figure of speech (Murdoch, 1892, p. 61). Ernest de K. Leffingwell (1919, p. 179) saw the Point Barrow natives "pick up a few pieces [of amber] a quarter of an inch in diameter from the protected beaches between Harrison and Smith Bays." The Eskimo also got amber for beads from the alluvium of the Yukon delta and from the Tertiary formations of the Fox Islands (Holmes, 1907, p. 48). The Koniagas of Kodiak Island prize labrets, ear ornaments, and pendants of amber which at times, particularly after earthquakes, is said to be thrown up upon the south side of the island. Broken beads and pieces of amber are placed on the graves of the wealthy. It is also an important, though rare and costly, article of commerce among them. (Cox, 1787, p. 212; Bancroft, 1886, vol. 1, pp. 72–73; Dall, 1870, p. 403; Petroff, 1884, p. 138.) That amber was widely traded in among the Eskimo long ago is shown by the presence of beads and uncut lumps in Thule culture ruins (about A. D. 600–1600) at Naujan on the shore of Fox Channel. Amber beads said to be of Asian origin were found in an Aleutian grave on Unalaska Island (Weyer, Jr., 1929, p. 234).

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[6] Personal communication.

Gerard Fowke (1894, p. 16) found in a grave in Rockbridge County, Va., a bead "resembling amber," which, he suggests, possibly may be of European origin. The occasional finding of amber on the adjacent Virginian coast appears to render such a conclusion unnecessary. W. M. Clark (1878, p. 275) reported amber beads in a Tennessee mound but as these were stolen before being placed in a museum, the observation must be accepted with reservations.

Amber and labrets of amber were among the tribute to be paid Montezuma by certain of the districts of Mexico, particularly the cities on the Atlantic coast and of Chiapas, a present-day locality. In Aztec times it was an important article of commerce. Sahagun (1880, p. 771) reports that amber was obtained by the Aztecs from "mines in the mountainous country." Clavigero reports that it was used as an ornament mounted in gold.

The amber of the north coast of Santo Domingo was gathered in pre-Columbian days. It was the first gem material recognized in the New World by the whites, as Christopher Columbus, in his account of his second voyage, says that the island contains "mines of copper, azure, and amber" (Kerr, 1811, vol. 3, p. 131).

SOAPSTONE (STEATITE)

Soapstone was used by practically all the North and Central American peoples, by the Indians of Puerto Rico, Venezuela, Colombia, Bolivia, Brazil, Argentina, and Chile, and by the Peruvians. The Cherokees of the Great Smokies, N. C., still make soapstone pipes, largely, however, for tourist consumption (Morley, 1913, p. 238) and Peter Kalm states that in 1748 soapstone pots were still used among the Delawares.

Steatite was quarried in a large number of places in the Appalachian uplift from Newfoundland to Alabama, some 33 being known to the writer. Other localities were Wyoming and Lac de la Pluie, southwest of Lake of Woods, Ontario (Mackenzie, 1902, vol. 1, p. xcii). Soapstone was also obtained in the Jacumba region, San Diego County, Calif. (Gifford, 1931, p. 29), and on Santa Catalina Island (Kroeber, 1925, p. 629). Stone hammers, mauls, and picks are common at such localities. A peculiar feature of the quarrying is the fact that bowls were in some instances largely shaped in place, then undercut, and only then broken off from the solid rock by gradual pressure of the chisel around the base of the bowl (Schumacher, 1879, vol. 7, pp. 117–121). At least the pots and other artifacts were usually roughly hewn at the quarry although they may have been finished at the home village. A. J. Pickett (1851, vol. 1, p. 177) states, from Indian testimony now over 100 years old, that in Alabama the Indians "cut out the pieces with flint rocks fixed in wooden handles. After working around as deep as they desired, the piece was pryed out of the rock."

In Norway and Sweden in the Viking time, about 1,200 years ago, the Scandinavians cut pots from soapstone in place much as did the American Indians of that or later times (Grieg, 1930; 1932, pp. 88–106). The Laplanders of northwestern Sweden [7] also cut their pots directly from the rock outcrop.

At Johnston, R. I., the largest pits are 10 feet long, 6 feet wide, and are now 5 feet deep although originally doubtless 15 feet deep (Denison, *in* Chase, 1885, pp. 900–901). The Narragansett Indians were famous steatite artisans and traders, and their pipes made of local steatite were in demand not only among the Mohawk but also by "our English Tobacconists for their rarity, strength, handsomenesse and coolnesse" (Wood, 1634, p. 65).

The Cumberland Sound Eskimo when breaking steatite from a quarry, "deposit a trifling present at the place, because otherwise the stone would become hard" (Boas, 1907, p. 138). The Eskimo on the west coast of Hudson Bay and the Copper Eskimo believe that steatite should not be worked while the people are living on the ice (Boas, 1907, p. 149; Jenness, 1922, p. 184). The former sometimes use steatite as bullets when lead is scarce. It is mined by Eskimo at the mouth of Tree River, which flows into Coronation Gulf, 75 miles east of the Coppermine mouth. The Coppermine Eskimo are dealers in soapstone lamps and pots, and at many of the soapstone localities the main occupation of certain Eskimo is pot making. Families from as far away as Cape Bexley visit the Tree River for the stone, being en route 1, 2, or more years and such trips are the subject of local songs. It is also distributed by tribal barter. It is believed by Stefánsson that this and localities east of it once supplied soapstone cooking utensils as far west as Siberia (Stefánsson, 1919, pp. 68, 112–113; 1914, p. 25). Stefánsson (1919, p. 28) states that to make a pot takes all an Eskimo's spare time for a year and that certain of the more skillful members of the tribe specialize in making such utensils.

CATLINITE

Catlinite (*Eyanskah* in Sioux) (Neill, 1858, p. 515) occurs in the Coteau des Prairies, Minn., on the Red Cedar branch of the Chippewa River, Wis. (Schoolcraft, 1853, p. 206; Strong et al., 1882, vol. 4, pt. 5, p. 578; West, 1934, pp. 72–73, 330–331; De la Ronde, 1876, pp. 348–349; Barrett, 1926; West, 1910, pp. 31–34; Brown, 1914, vol. 13, pp. 75, 80–82), in Scioto County, Ohio (Shetrone, 1930, p. 178), and in Arizona. The latter is probably the oldest of the localities, as catlinite artifacts occur in the Pueblo II culture stage of Utah (A. D. 200–800). The next oldest of the localities certainly worked by the aborigines was the Ohio locality. Its trade area was much more restricted than that of the Minnesota catlinite, but it was extensively used in Ohio and Kentucky and in some instances reached even Iowa and Wisconsin. The Minnesota and Wisconsin localities, while probably the youngest of the catlinite mines worked by the aborigines, are well over 300 years old. Sioux myths connecting catlinite with the creation of man suggest a greater age, but myths of the long ago conceivably can grow in a day. Catlinite was also obtained from the glacial drifts in the upper Mississippi Valley (pl. 5).

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[7] Personal communication, Hans Lundberg.

To the Coteau des Prairies, the surrounding tribes from hundreds of miles around made yearly mining pilgrimages to obtain material for their pipes. The Great Spirit, after miraculously forming the pipestone, had dedicated the ground as neutral property where war was taboo, an admonition for a time respected. Even while en route to the quarries, the Indians' bitterest enemies would not attack them. (For a poetical rendering of Indian catlinite myths, see Longfellow's Hiawatha.) According to the Sioux, catlinite attained its color by being stained by the blood of buffalo slain by the Great Spirit, while to the Indians of the upper Missouri, it was the flesh of Indians drowned in a great flood (Armstrong, 1901, pp. 2–4, 11).

L. N. Nicollet, who visited the quarry in the Coteau des Prairies in 1838–39 (1843, pp. 15–17), adds that the Indians believe that when they visit the quarry they are always saluted by lightning and thunder and that its discovery was due to a deep path worn down into the catlinite bed by the buffalo, the path being still visible at the time of Nicollet's visit. Three days of purification preceded the Indians' visit to the quarry during which time he who was to do the quarrying must be continent. The Abbé Domenech (1860, vol. 2, p. 347) adds that during this period the miners fasted. Provided the pit, which the Indian miner sinks, does not encounter catlinite of good quality, he is considered to have "impudently boasted of his purity. He is compelled to retire: and another takes his place." A Sioux who visited the quarry about that time says that first there was a feast to the spirits of the place and then before quarrying a religious dance was held (Dodge, 1877, p. XLVII). The Indians (Domenech, 1860, vol. 2, p. 273) were loath to have white men visit the quarry as their presence was a profanation which would draw down the wrath of heaven on the Indians. Before mining began the medicine men invoked and propitiated the spirits of two glacial boulders nearby, symbolizing two squaws, the guardian spirits of the place (Schoolcraft, 1851–57: Catlin, 1913, vol. 1, pp. 25–26; vol. 2, pp. 186–195, 228–234).

A small creek at the foot of a quartzite ridge probably originally exposed the thin bed (18 inches) of reddish fine-grained somewhat metamorphosed clayey sediment (catlinite). At the base of the wall and parallel to it is a prairie one-half mile wide. On it for a distance of almost a mile are many pits from 20 to 40 feet wide and from 4 to

10 feet deep sunk through the soil to procure the pipestone (pl. 5). The tools were roughly shaped hammers and sledges from the nearby quartzite ledges, some of the hammers being grooved. Hieroglyphics are common on the faces of the rock ledge and tradition says that each Indian before venturing to quarry Catlinite inscribed his totem thereon (Mallery, 1893, p. 87). Remains of ancient camp sites abound nearby and in them are found partially worked fragments of pipestone, the material in part having been carved at the quarry, perhaps because with age this rock is said by some to become indurated. (Holmes, 1892, p. 277; 1919, pt. 1, pp. 109, 253–263; Nicollet, 1843, p. 15; Winchell, 1884, pp. 541–542; Hayden, 1867, pp. 19–22; West, 1934, p. 329; Lynd, 1865.)

Groseilliers and Radisson in A. D. 1658–60 were perhaps the first whites to see catlinite for they mention pipes of a red stone owned by the Nation of Beef living west of Lake Superior. Father Marquette (Repplier, 1929, p. 151) smoked a pipe of peace of catlinite in 1673 and Le Seur in 1699–1700 mentions the Hinhoneton's "village of the red stone quarry" (Shea, 1861, p. 111). Father Charlevoix (1763) mentions its source as among the "Ajouez (Iowa) beyond the Mississippi." Initial quarrying by Indians must have preceded the seventeenth century. Le Page du Pratz (1758, vol. 1, p. 326) states that when M. de Bourgmont, in 1724, was en route to visit the Padoucas, he saw a cliff on the banks of the Missouri, consisting of a "mass of red stone with white spots like porphyry" but soft, easily worked into pipes and fire-resistant; this lay between two valueless stones. "The Indians of the country have contrived to strike off pieces thereof with their arrows and after they fall in the water plunge in for them." This strangely perverted account of the method of obtaining catlinite is similar to that by which Pliny states the Persians obtained turquoise.

Jonathan Carver (1778, p. 99), who traveled in the upper Mississippi region in 1766–68, shows on his map Couteau des Prairies as "Country of Peace." Lewis and Clarke (1804–06) also speak of the Indian tribes meeting there in "friendship" to collect stones for pipes (Coues, 1893, vol. 1, p. 80) but in 1837 when George Catlin visited it (1848, vol. 2, p. 166) the Sioux were in possession and did not permit their enemies to procure pipestone. Indeed an old chief of the Sauk complained to Catlin that, while as a young man, he visited the place to dig catlinite "now their pipes were old and few." "The Dakotans have spilled the blood of the red men on that place and the Great Spirit is offended" (Catlin, 1848, vol. 2, p. 171). Thus, prior to about 1810 the quarry was neutral ground, but after that date was in the possession of the Sioux. About 60 years ago, Professor Crane reported that 300 Yankton Sioux took part in the annual pilgrimage to the quarry, and an Indian chief claimed 100 years ago he had seen 6,000 Indians encamped at the quarry for 2 months (Barber, 1883, pp.

745–765). The Yankton Sioux by article 8 of the treaty with the United States, dated April 19, 1858, have the right in perpetuity to mine catlinite within about a square mile surrounding the quarry (S. Dak. Hist. Coll., 1902, vol. 1, app., p. 449). While these people and their friends, the Flandreau Sioux, still visit [8] the locality, many of the pipes and trinkets sold since at least 1866 have been of white manufacture. Indeed, Indian traders had glass beads, imitating catlinite, by the end of the eighteenth century.

The trade in catlinite was Nation-wide, extending from Canada to the Gulf of Mexico and from the Atlantic to well within the Rocky Mountains Iowa Indians, according to Father Louis André (Thwaites, 1896–1901, vol. 60, p. 203), in 1676, had Minnesota catlinite and the Iroquois and Algonquin peoples on the Atlantic coast by intertribal barter late in the seventeenth century. Peter Kalm, Professor of Economy, University of Abo, Finland, who traveled in North America from 1748 to 1751 (Pinkerton, 1808–14, vol. 13, p. 516; Kalm, 1772, vol. 2, p. 43) says the chiefs of the Indians of Pennsylvania had pipes ingeniously made of "very fine red pot-stone or a kind of serpentine marble of the kind which Father Charlevoix says comes from beyond the Mississippi." They were very scarce and were valued "as much as a piece of silver of the same size and sometimes they make it still dearer." Loskiel (1789, p. 66) says that the Delawares and Iroquois got their pipes direct from Indians "who live near the Marble River, on the western side of the Mississippi, where they extract it from a mountain." If so, these Indian merchants carried their wares 1,000 miles from their homes. Among the Wisconsin Menomini, the journey to the quarry in Minnesota being long, small blocks of catlinite were locally valued at $100. At Fort Union in 1852, Kurz purchased a "charming" catlinite pipe from an Absaroka for $7, although among the Crows it would have been worth a packhorse (Kurz, 1937, p. 257). He adds that, though fashioned by the Sioux, they are articles of barter among all the other tribes.

The red pipestone found in the Ohio Mound Builders mounds was doubtless largely obtained from the Ohio pits (Shetrone, 1930, p. 178, and personal communication) but that from the mounds in Lyon County, Iowa, presumably, as A. R. Fulton holds (1882, p. 89), came from the Minnesota quarry. The Ohio pipestone is of lighter color than that of the other localities, being pinkish or grayish.

There are a number of catlinite quarries in Barron (at least five quarries) and Chippewa Counties, Wis. The largest quarry, situated on a hill, is about 25 feet square and not over 3 feet deep. In places, the indurated shale was stoped back beneath the overlying quartzite. The Indians worked here at least as late as 1914. The catlinite is reddish brown in color and was used extensively by the Indians. De la

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[8] Personal communication, G. L. Chesley, postmaster, Pipestone, Minn.

Ronde visited the locality over 100 years ago and states that the Indians travel many miles to obtain the catlinite and that while there peace reigns. He tells a dramatic story of a Sioux and a Chippewa who by chance met at the mine and peaceably procured their pipe material but as soon as they were a respectable distance from the sacred spot fought a duel to the death.

The Pueblos imitated catlinite in pottery, showing the esteem in which they held catlinite, some of which occurs in the ruins of Arizona. It doubtless came from the Jerome Junction, Arizona locality (Schrader, Stone, and Sanford, 1917, p. 18).

OBSIDIAN

Obsidian was used throughout North and Central America, except in eastern Canada, New England, the North Atlantic (a single obsidian artifact has been found in Pennsylvania), and the southeastern States (artifacts have been reported from Georgia and Alabama, however) and it was used in South America by the Indians of Colombia, Ecuador, Bolivia, British Guiana, Peru, Argentina, Chile, and Brazil, and also by those of the Lesser Antilles. By trade it traveled vast distances.

Obsidian was quarried at Obsidian Cliff, Yellowstone National Park, and elsewhere in the Yellowstone and Snake River Valleys as well as in Utah, New Mexico, Arizona, and Nevada (Holmes, 1919, pp. 214–227). Apparently the Obsidian Cliff, Yellowstone National Park, was neutral ground to Indians seeking arrowhead material (Alter, 1925, p. 381). From shallow shafts, drifts were driven (Brower, 1897, pp. 20–24). Shell heaps around San Francisco Bay, in the opinion of A. L. Kroeber (1925, pp. 927–930), show that obsidian was used from 3,000 to 3,500 years ago. Unworked blocks are buried therein as if of great value. It is reported in Minnesota in deposits antedating the last glacial state (Hagie, 1936).

Obsidian was obtained by the aborigines in some 10 California localities either in place or as pebbles. The Pit River Indians made long trips to Sugar Hill in the summer to procure obsidian pebbles (Kniffen, 1928). The hill was sacred and the Indians feared to offend its spirit. The Klamath Indians of southeastern Oregon believed that arrows made from obsidian obtained on a mountain west of Klamath Lake were poisonous (Spier, 1930, p. 32; Rust, vol. 7, 1905, pp. 688–695). Herbert J. Spinden (1908, vol. 2) states the Nez Percé's name for the John Day River meant "obsidian river." The Mandan Indians remelted glass and cast characteristic beads: if, as tradition holds, they learned the art from the Snake Indians, their original raw material may have been obsidian from the Yellowstone National Park, rather than clay (Matthews, 1877, pp. 22–23).

Obsidian was abundantly used by the Mound Builders and the Hopewell (Ohio) people had ceremonial knives 18 inches long and over 6 inches wide. Evidently blocks of obsidian were imported and the material worked up in the Mound Builders' village. Shetrone (1930, p. 65) thinks that, as obsidian and grizzly bear teeth are found together in the Hopewell culture mounds and not in quantity, at least, to the west, the Hopewell men sent special expeditions to the Yellowstone Park to obtain obsidian.

The pueblos of New Mexico and Arizona had obsidian at hand at many places. They not only quarried it but also apparently depended for their supply on the shattered outcrops. The Tewa Indians of the upper Rio Grande Valley, N. Mex., believe that the flaking of the outcrop is due to lightning striking it (Harrington, 1916, p. 59).

Obsidian was doubtless used a very long time ago by the peoples of the Southwest, as Earl H. Morris (1919, p. 202) reports that the obsidian implements from ancient ruins in southwestern Colorado are so old that they have acquired a "dull gloss," or patina. That it was long in use among certain of the Indians is also indicated by the Athabascan folk tale in which it was one of the four substances existing before the world was created (Goddard, 1827, p. 180).

The Aztecs and their predecessors used obsidian extensively, fashioning from it spear and arrow points, knives, razors, and swords, mirrors, beautiful masks, and dainty ear ornaments. The Aztecs called it *iztli* and because of its many uses it was surnamed *teotetl* (divine stone) (Bancroft, 1883, vol. 3, p. 238). So abundantly was it used by the Aztecs that some of the refuse heaps around Mexico City are black with its fragments (Holmes, 1900, p. 406). Obsidian must have been long known to the Aztecs as one of their gods was Itzpopalotl (Obsidian Butterfly) (Verrill, 1929, p. 185). Further at Cuichuilco near Mexico City, Dean Byron Cummings in 1916 found a structure which, in its relation to certain lava flows, he believed long antedated the Aztecs. Nearby, Mrs. Zelia Nuttal found fragments of obsidian flakes "with a dull surface and a patina which unquestionably indicate great antiquity" in an ancient river bed, 17 feet beneath the lava bed (Mason, 1931, p. 30).

Alexander de Humboldt rediscovered the old Aztec obsidian pits of Sierra de las Navajas some 10 miles east of Pachuca (1811, vol. 3, p. 122; 1815, vol. 1, p. 337). The aborigines, over hundreds of acres, according to W. H. Holmes (1900, vol. 2, pp. 405–416) in an area 1½ miles long and in places one-half wide, sunk shallow pits and gophered out horizontally from them where the obsidian was of good quality. The spall heaps nearby run into the hundreds of tons. W. H. Holmes, who says that the deepest pits are now 20 feet deep although once deeper, estimates that the workings are about as ex-

KEY TO ABBREVIATIONS USED IN TABLE 1

Central America:	
Costa Rica	C.
Nicaragua	N.
Panama	P.
San Salvador	S.
West Indies:	
Santo Domingo (Hispaniola)	S.
Montserrat	M.
Jamaica	J.
Puerto Rico	P.
Cuba	C.
Guadeloupe	G.
Trinidad	T.
Lesser Antilles	L. A.
Northern South America:	
British Guiana	Br.
Venezuela	V.
Colombia	C.
Ecuador	E.
Bolivia (in part Incan)	B.
Dutch Guiana	D. G.
Southern South America:	
Argentina	A.
Chile	C.
Paraguay	P.
Brazil	B.

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Table 1.—*Precious and decorative stones used by Indians*

Gems and stones	Alaska, Arctic littoral	British Columbia	Central and eastern Canada	New England	North Atlantic States (New York-Maryland)	Southeastern States (Virginia-Florida)	Upper Mississippi Valley (Minnesota, Michigan, West Virginia, Ohio, Illinois, Indiana, Iowa)	Lower Mississippi, Kentucky, Tennessee, Missouri, to Louisiana	Northern Plains (Dakotas, Kansas, Nebraska)	Southern Plains (Oklahoma, Texas)	Western Mountains (Montana, Wyoming, Idaho, Colorado, Utah, Nevada)	Oregon, Washington	California	Southwest		Mexico		Central America		West Indies	Peru	Northern South America	Southern South America
														Wild tribes, Arizona	Pueblos	Aztecs, Toltecs	Wild tribes	Mayas	Other than Mayas				
Diamond																							(?) (B.)
Graphite	X	X	X	X	X	X	X				X												
Galena	X	X	X			X	X	X			X			X	X								
Pyrite	X	X	X	X	X		X		X				[1]X		X	X		X	X (C., P.)		[4]X	X (E., C., B.)	X (C., A.)
Marcasite						X	X			X						X		X			X		
Fluorite							X	[5]X					X		X	X					X	X (B.)	
Atacamite																					X		X (C., A.)
Rock crystal	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X (C., P.)	X (M., H., L. A., C., P., J.)	X	X (Br., C., E., B., D. G., V.)	X (A., P., B., C.)
Rose quartz			X		X	X			X							X							X (B.)
Smoky quartz	X		X	X		X	X				X	X	X		X						X		
Citrine						X	X		X														
Iris							X																
Gold quartz						X							X	X									
Amethyst	X		X			X	X						X		X	X			X (C.)	X (M., L. A.)	X		
Aventurine quartz																X		X					
Chalcedony	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X (C., P.)	X (M., H., J.)	X	X (E., B.)	X (C., A.)
Onyx						X						X											
Carnelian						X	X				X	X	X	X	X	X		X	X (C., P.)	X (M., L. A.)		X (C., V., E., Br.)	X (B.)
Chrysoprase													(?)								X	X ([illegible])	
Prase															X	X							
Plasma																X			X (P.)				
Agate	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X (C., P.)		X	X (Br., C., E.)	X (C., B., A.)
Agatized wood	X		[6]X			X	X	X		X	X	X	X	X	X	X	X	X					
Jasper	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X (C., P.)	X (L. A.)	X	X (Br., C., E., D. G., V.)	X (C., B., A.)
Bloodstone												X				X			X (P.)		X		
Moss Agate			[7]X		X	X				[9]X	X	X	X		X								
Opal (common)		X					[8]X		X		X	X	X		X	X		X	X (P.)		X		X (A., B.)
Opal (fire)																X							
Opal (noble)												X						X					
Ruby-sapphire						(?)																	
Hematite	X		X	X	X	X	X	X	X	X	X		X		X	X	X	X	X (P.)	X (C.)	X	X (V., E., B.)	X (B., A.)
Magnetite															X						X		
Calcite	X	X	X		X	X	X	X	X		X		X		X	X		X	X (P., H.)	X (J., G., P.)	X	X (B., C., V.)	X (A.)
Alabaster ($CaCO_3$) (includes stalactites and satin spar)			X		X	X	X	X					X		X	X		X	X (H.)	X (P., C.)	X	X (B., C., E.)	X (C., A., B.)
Aragonite															X								
Magnesite		X									X		X		X								
Smithsonite															X (?)						X		
Malachite		X	X											X	X	X		X			X	X (E., C., B.)	X ([illegible])
Azurite	X		X												X			X		X ([illegible])		X (B.)	X (C.)
Feldspar (white)													X	X		X							
Feldspar (pink)													X	X	X								
Amazonstone							X						X			X		X		X ([illegible])		X (V.)	X (B.)
Sunstone														X									
Labradorite	X																		[11]X (P.)				
Moonstone																X							
Diopside		X													X								
Jadeite	X	X					X								X	X	X	X	X (B., C., N., S., P.)	[12]X (J., H., P.)	X	X (E., C., B.)	X (B.)
Chloromelanite																X		X				X (C.)	X (C.)
Pectolite	X	X																					
Dumortierite																	X						
Nephrite	X	X	X								X	X	X (?)		X	X		X	X (C.)	X (M., C., A.)	X	X (V., C., E.)	X (B., A., C.)
Actinolite													X		X								
Beryl											X					X			X (P.)		X		X (B.)
Golden beryl						X																	
Emerald																(?)		(?)	X (P.)		X	X (V., C., E., B.)	X (B.)
Sodalite																					X	X (B., E.)	X (A.)
Staurolite						[13]X																	
Lapis lazuli																				X (M.)	X	X (B., E.)	X (C.)
Garnet							(?)								X	X	X				X		
Olivine							X								X								
Scapolite															X						X		
Sillimanite															X								X (B.)
Saussurite																						X (E.)	
Calamine																	X						
Tourmaline													X										
Mica	X	X	X	X	X	X	X	X					X		X	X			X (S., P.)		X	X (V., E.)	X (A.)
Fuchsite						[14](?)												X					
Agalmatolite																		X				X (E., C.)	X (C.)
Chlorite		X	[15]X	X	X	X	X	X	X			X				X					X		
Serpentine (includes picrolite)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X (P., C., S.)	X (G., C., T.)	X	X (E., B., V., C., D. G.)	X (B., A.)
Steatite	X	X	[16]X	X	X	X	X	X	X		X	X	X		X	X		X		X (P.)	[17]X	X (B., V., C.)	X (B., C., A.)
Lithomarge																X							[18]X (C.)
Catlinite			[19]X	[20]X	X	[21]X	X	X	X	X	[22]X	X	X	X	X	[23]X							
Chrysocolla													X	X							X	X (B.)	X (C., A.)
Apatite															X								
Lazulite																					X	X (B.)	
Turquoise	X					(?)	[24](?)	[25]X		X	X		X	X	X	X	X	X		X (M.)	X	X (B., E., C.)	X (A., C.)
Variscite (Utahlite)											X				X								
Barite						X		X															
Celestite					X																		
Brochantite																						X (B.)	X (C.)
Gypsum	X		X	X	X		X		X				X		X		X	X	X (C.)	[26]X (C.)			X (C., A.)
Selenite				X							X				[27]X								X (A.)
Jet, lignite, cannel coal, bituminous coal	X	X	X		X	X	X	X			X				X	X	X	X		X (M.)		X (E.)	
Amber	X	X				X	X (?)	(?)								X	X	X		X (S., L. A.)	X	X (C.)	X (B.)
Obsidian	X	X	[28]X		X	X	[29]X	X	X	X	X	X	X	X	X	X	X	X	X (S., P., C.)	X (L. A.)	X	X (C., E., B., Br.)	X (A.)
Fossils			[30]X		[31]X	[32]X	[33]X		[34]X		[35]X				[36]X			[37]X	X (P.)		[38]X	[39]X	

[1] Also arsenopyrite.

[2] Also blende and chalcopyrite.

[3] Also chalcopyrite.

[4] Also pyrrhotite.

[5] Missouri, Tennessee, and Kentucky.

[6] Saskatchewan, Ontario.

[7] Saskatchewan.

[8] Reported Wisconsin.

[9] Texas.

[10] Hyalite.

[11] Anorthite.

[12] Caicos Islands, St. Kitts.

[13] Virginia probable.

[14] Georgia.

[15] Northwest Territories.

[16] Including Northwest Territories.

[17] Also talc.

[18] Halloysite.

[19] Saskatchewan at Regina, Northwest Ontario, Quebec, C., Labrador, Manitoba, Northwest Territories.

[20] New Jersey and New York.

[21] Georgia and North Carolina.

[22] As far as Idaho.

[23] Chihuahua.

[24] Wisconsin probable.

[25] North Carolina and Mississippi.

[26] Caicos group of Bahamas.

[27] Also satin spar.

[28] Manitoba, Saskatchewan.

[29] Isle Royal.

[30] *Baculites, Inoceramus.*

[31] Coral.

[32] Shark's teeth, coral.

[33] Coral, crinoids.

[34] Aragonite, baculite.

[35] Crinoid stem.

[36] Shell, coral, crinoids.

[37] Shells.

[38] Shark's teeth.

[39] Mastodon teeth (Colombia).

tensive as the great flint quarries at Hot Springs, Ark., and Flint Ridge, Ohio. Stone hammers, discoidal or globular in form, were found near the pits. In part, at least, the material was worked locally but it was also transported in the rough to distant markets. Löwenstern (1843, pp. 244–245) describes these mines as trenches from 1 to 2 meters wide and of varying depth. From the extent of the pits it is believed that mining began some centuries before the arrival of the Spaniards (Tylor, 1861). It was also quarried at Zacaultipan and 15 miles south of Tulancingo, Hidalgo; at Teuchitlán, Ixtlan de los Buenos Aires, and Etzatlan, Jalisco; Pica de Orizabo, Veracruz; Zinapécuaro, Michoacan; and elsewhere in Mexico. At Teuchitlán some of the flakes are so very old that they are covered with a thick white crust (Breton, 1905, pp. 265–268).

The Mayas got their obsidian doubtless in part, at least, from the extensive ancient quarries at La Joya, 18 miles east of Guatemala City. It also occurs at Fiscal (on the railroad from Guatemala to Zacapa) and near Antiqua (Holmes, 1919). At Flores, Guatemala, the local "small change" consists of oblong pieces of obsidian, the value depending on the size and shape of the piece (Boddam-Whetham, 1877, p. 296).

Don George Juan and Don de Ulloa (who travelled in Peru in 1734) refer to ancient aboriginal mines of obsidian in that country (Pinkerton, vol. 14, pp. 545–546). The Ecuador Indians had an obsidian quarry at Guamani and a thriving commerce in it was carried on with the coastal Indians. In their Quichua language it was known as *aya-collqui*, "silver of the dead," certainly an apt poetic name.

OTHER MINERALS

Diopside was used by the Indians of British Columbia and the Pueblos, as was actinolite by the California Indians and the Pueblos. Scapolite was utilized by the Pueblos and the Peruvian Indians. Sillimanite was used by the Pueblos and the Brazilian Indians. Saussurite was employed by the Indians of Ecuador. Chlorite was commonly used in North America, only rarely in South America. Agalmatolite was made into artifacts by the Mayas and the Indians of Ecuador, Colombia, and Chile. Apatite was known by the Pueblos. Barite was used by the Indians of Kentucky and by those of Georgia. Artifacts are common in the vicinity of Cartersville in the latter State, a district in which barite residuals are abundant. Celestite was made use of by the Indians of New York. Gypsum was utilized widely by the Eskimo, the Indians of Eastern Canada and the northeastern United States, those of the upper Mississippi Valley, northern plains, the Rocky Mountain States and California; also by the Pueblos, the northern Mexicans, the Mayas, and the Indians of Costa Rica, Cuba, Bahamas, Chile, and Argentina.

LIST OF MINES OPERATED BY THE INDIANS (pls. 4, 5)

Aga,	Agalmatolite: Paccha, Ecuador.
A,	Agate: Southampton Island, Canada; AgateBay, Two Harbor, Minn.; Spedes Valley, Wash. (also opal, etc.); Millers Island, Wash. (also opal, etc.); cataracts, Demarara R., British Guiana; Parima Mountains, Venezuela.
Ag,	Agatized wood: Petrified Forest, Adamana, Ariz. (also amethyst, smoky quartz, etc.); Petrified Forest, 25 miles south of Chambers, Ariz. (also chalcedony, etc.).
Al,	Alabaster: Wyandotte Cave, Crawford County, Ind.; Tecali, Puebla, Mexico.
Am,	Amber: Aliaska Peninsula; Aliaka Isle; Unalaska Island; Umnak Island, Yukon Delta, Alaska; Ookamak Island and south side Kodiak Island, Alaska; Point Barrow, Alaska; north coast, Santo Domingo; Chiapas, Mexico.
At,	Atacamite: Chuquicamata, Chile.
Ba,	Barite: Bartow County, Ga.
B,	Brochantite: Chuquicamata, Chile; Corocoro, Bolivia.
Ca,	Cannel coal: Blennerhasset Island, W. Va.
Ct.,	Catlinite: Pipestone, Minn.; Chippewa County, Wis.; Barron County, Wis., five quarries; Scioto County, Ohio.
C,	Chalcedony: Warsaw, Coshocton County, Ohio (numerous quarries); Redondo Beach, Calif.; Ballast Point, 5 miles below Tampa, Fla.; Wagon Wheel Gap, Colo. (also jasper); Saugus Center, Mass.; 100 miles northwest of Pinto Basin, Calif.
Ch,	Chrysocolla: Quebrade de Cobres, northwestern Argentina.
Cy,	Chrysoprase: Tulare County, Calif. (possible).
E,	Emerald: Coscuez, Chivor-Somondoco, and Muzo, Colombia.
F,	Fluorite: Southern Illinois.
G,	Galena: Golovin Bay, Alaska; Coronation Bay, Canada; Anse-a-la Mine, Quebec; Wisconsin-Iowa-Illinois lead district; southeastern Missouri; Cook's Peak, N. Mex.; near Lexington, Ky.
Ga,	Garnet: Picuries, Taos County, N. Mex.; Navaho Reservation, N. Mex.; northeast Arizona; north central Arizona; Jaco Lake, Chihuahua, Mexico; near Quito, Ecuador.

H, Hematite and red ochre:

Mackenzie River at Fort Good Hope, Canada; Tulameen River, British Columbia; Tanana River, Alaska; Leslie, Franklin County, Mo.; Iron Mountain, Mo.; Marquette, Mich.; 44° N., 111° W., Ross Co., Ohio; Cataract Canyon, Ariz.; Red Canyon, Green River, Utah; Wellington, Calif.; Manzano Mountains, N. Mex.; 4 miles southwest of Zuñi, N. Mex.; Katahdin, Maine; Nodules, Kanawha Valley, W. Va.; Kaimak, Argentina.

I, Iron pyrite:

Point Barrow, Alaska; Rowsell Harbour, Labrador; northwest of Coronation Bay, northern Canada; 92°30′ W., 69°30′ N.; Victoria Island; creek east of Coppermine River; near Wager Inlet and Repulse Bay; Bad Creek, 70° N., 117° W.; Mackenzie 10 miles below Fort Good Hope, alluvial; Whitemud River, Saskatchewan; north part Tierra del Fuego Island; Mercury Sound, Clarence Island.

J, Jasper:

Saugus Center, Mass.; Chester Bucks, Lancaster, Lehigh, and Berks Counties, Pa.; Flint Ridge, Licking, and Muskingum Counties, Ohio (also chalcedony); Normanskill on Hudson River, N. Y.; Converse County, Wyo. (also chalcedony); Delaware River, Mercer County, N. J.; St. Tammany Parish, La.; 40 miles south of Twenty-nine Palms, Calif.; 40 miles north of Pinto Basin, Calif.; Calpulalpam, Mexico; Mount Roraima, British Guiana.

La, Labradorite:

Labrador, near Paul's Island.

L, Lignite:

Fifteen miles north of Holbrook, Kokopuyama, and Tusayan, Ariz.

Li, Limestone:

For pipes, Ottawa River at Portage du Grand Calumet; Lake Winnipeg River to west of Pike River; Falls of Montmorenci near Quebec; Sitka, Alaska; Lynn Canal, Alaska; Nipigon Island, Lake Superior; Flint River, Ga.; St. Joseph's Island, Ontario.

Mg, Magnesite:

White Buttes, near Cache Creek, Calif.; Sulphur Bank, Clear Lake, Calif.; Kaolin, Nev.

Ma, Malachite:

Cataract Canyon, Ariz.; Azurite Mountains, N. Mex.

Ma, *Az*, Malachite and azurite:

Highland, west of Luna, New Mex.; Aquarius and Hualpai Ranges, Ariz.

Mo, Moss agate:

Between Fort Ellis and Yellowstone River, Mont.; valley north of Uinta Mountains and San Rafael Valley, Utah.

M, Mica:

Spruce Pine (two pits), Bandana (two pits, Mitchell County), Bakersville, (Mitchell County), Yancey County, and Macon County (12 pits), N. C.; Amelia County, Va.; Chilton County, Jefferson County, Coosa County, Clay County, Randolph County, and Cleburne County, Ala.

N, Nephrite:

Jade Mountain, north side of Kobuk River, Alaska; Fraser River and Thompson River, British Columbia; Puget Sound; divide headwaters of Orinoco and Rio Branco Railroad, British Guiana.

●, Obsidian:

Rocky Mountains, about 62°30′ N.; Mount Anahim, 100 miles northeast Prince Rupert, British Columbia; Mountains of Thompson River, British Columbia; Klamath Lake, Oreg.; John Day River, Oreg.; Glass Butte, Lake County, Oreg.; Obsidian Cliff, Yellowstone National Park; Promontory Point, Great Salt Lake, near Willard; Shingle Spring (Sierra Nevadas), Clear Lake, lower Clear Lake, Head of Napa Valley, Upper Sonomo Valley, Cole Creek, Shasta County, Glass Mountain, Sugar Hill, Wheatland, Cortina, Mount Kilili (near Tuolumne), Mount Kanaktai (Sonoma County), and near Fillmore (Ventura County), Calif; near Pecos Church, headwaters Gila River, and Jemez Plateau, N. Mex.; east of Silver Peak, Nev.; Robinson Crater and Mount Sitgreaves (latter detrital) in San Francisco Mountains, Ariz.; Sierra de las Navajas, Zacaultipan, and south of Tulancingo (Hidalgo), Cerro Tepayo, Teuchitlan and Ixtlan de los Buenos Aires and Etzatlan (Jalisco); Pica de Orizabo (Veracruz), and Zinapecuaro (Michoacan), Mexico; La Joya, Antiqua, and Fiscal, Guatemala; Patagonia (detrital 48°10′ S., 72° W.); Guamani, Ecuador.

O Olivine:

Navaho Reservation, N. Mex.

R, Rock crystal:

Mackenzie River mouth, Canada; James River, 12 miles above Richmond, Va.; Hot Springs, Ark.; Little Falls, Morrison County, Minn.; west end Wichita Mountains, Okla. (also jasper); Yakima Valley, Wash.; Armonk, Westchester County, N. Y.; east end, Long Island, N. Y.; Tiquie River, Colombia; near Guayaquil, Ecuador; Pikin Mountain, Brazil; Manhattan Island, N. Y.; Compounce, Conn.; northern Oaxaca, Mexico.

S, Selenite:

Southern Nebraska; near Zuñi, N. Mex.; southeast New Mexico.; near Santa Fe, N. Mex.; 44°10′ N., 104°18′ W., S. Dak.; Gypsum Cave, near Las Vegas, Nev.; Kaolin, near St. Thomas, Nev.; Mammoth Cave, Ky.

Se, Serpentine:

Two to two and one-half miles north of Phillipsburg, N. J.; Red Rock, Grant County, N. Mex.; streams near Jade Mountain, Alaska; Pipestone Lake, 54°30′ N., 93°30′ W.; Anderson Lake, British Columbia.

Sl, Slate:

Skidegateon, Queen Charlotte Island, British Columbia; 5 miles up Mattawa River; Elk River, Canada.

▲, Soapstone:

Ukasiksalik and Nachvok Fiord, (several localities), Labrador; Buck River, 95° W., 67° N.; Simikameen R., British Columbia; Pipestone Lake, Manitoba; Lac de la Pluie, Canada; Reindeer Lake, west shore 103° W., 57°30′ N.; just west of Great Slave Lake; Utkusikaluk about 111° W., 67°40′ N.; 68° 10′ N., 114° W., on Coronation Bay; 112°30′ W., 67°45′ N.; Reindeer Island in Great Slave Lake; Lake of Woods, Akkoolee, near Repulse Bay; 96° W., 66°30′ N.; 90° W., south of Pelly Bay; Arctic Ocean, 60 miles east of Mackenzie River; Cumberland Sound; mouth, Tree River; Fleur de Lis, Newfoundland; Johnson, Vt.; Westfield, North Wilbraham, and Millbury, Mass.; Johnston and Providence, R. I.;

Bristol, Nepaug, Portland, and Harwinton, Conn.; Christiana and Bald Hill, Lancaster County, Pa.; four localities Patuxent Valley (Montgomery and Howard Counties), Olney, and Clifton, Md.; Washington, D. C.; below Little Falls, near Washington, D. C.; Culpeper, Wayland Mill (Culpeper County, two localities), Orange (Madison County), Falls Church, 6 miles west of Lawrenceville (Brunswick County), Norwood, Amelia Court House (two localities, Amelia County), Caledonia (Goochland County), and Clifton (Fairfax County), Va.; Fawn Knob, Yancey County, N C.; Roane Mountain, Tenn.; Coon Creek, Tallapoosa County, and Jefferson County, Ala.; Clam River, Burnett County, Wis.; Jacumba (San Diego County) and Santa Catalina Island, Calif.; Columbia River above Kettle Falls, Wash.; Pipestone Creek, southwest Montana; bordering Buena Vista Hills, San Joaquin Valley, Calif.; Tuolumne, Calif.; 4 miles northeast of Lindsay, Calif.

So, Sodalite:
Cerro Sapo, Cochabamba Cordillera, Bolivia.

Su, Sunstone:
Reservation near Globe, Ariz.

To, Tourmaline:
Mesa Grande, San Diego County, Calif.

T, Turquoise:
Los Cerrillos, Burro Mountains, Hachita Mountains, Jarilla Mountains, and Paschal, N. Mex.; Sugar Loaf Peak (Lincoln County), Columbus (Mineral County), Crescent (Clark County), Royston (Nye County), near Boulder City, and northeast of Searchlight, Landon County, Nev.; Turquoise Mountain, Cochise County, Ariz.; Mineral Park, Mohave County, Ariz.; Manvel, also Silver Lake, San Bernardino County, Calif.; La Jara, Conejos County, Colo.; Chuquicamata, Chile.

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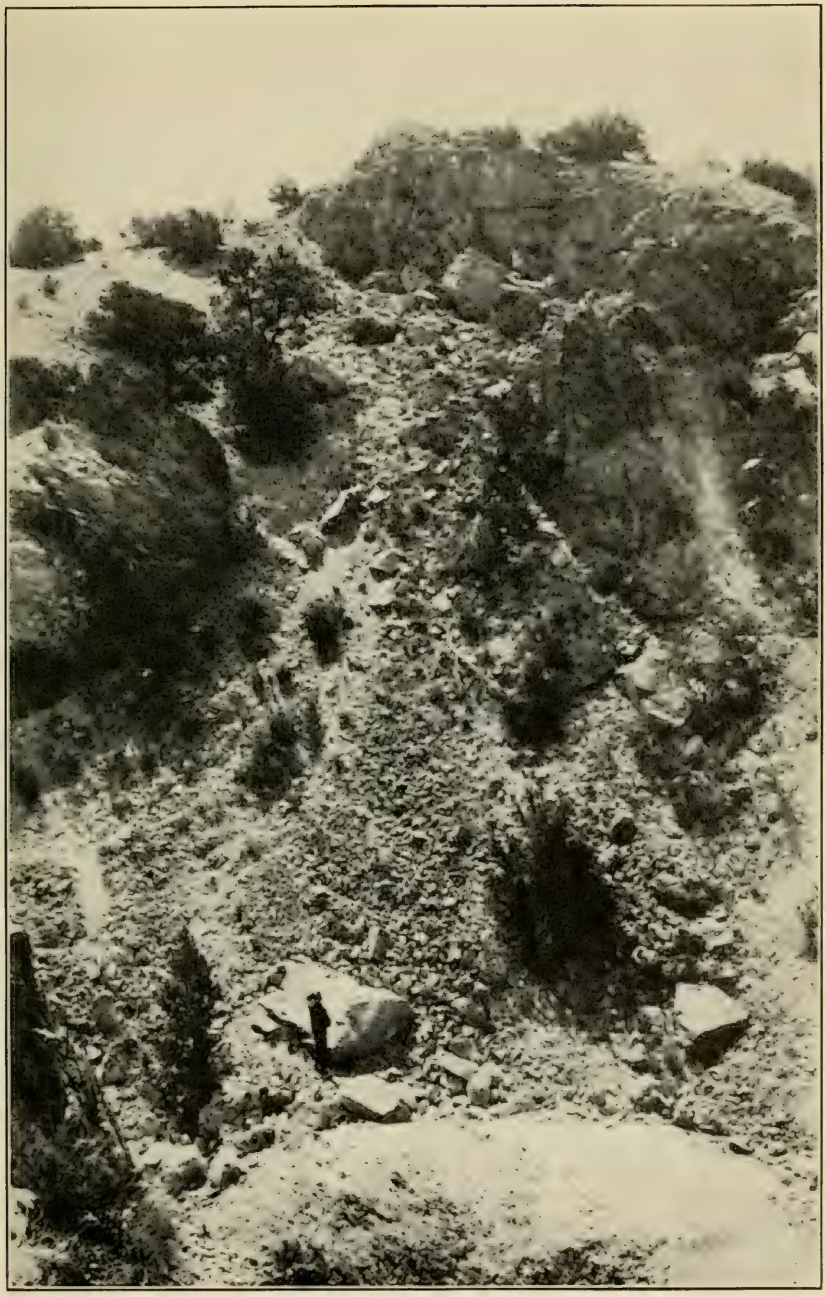

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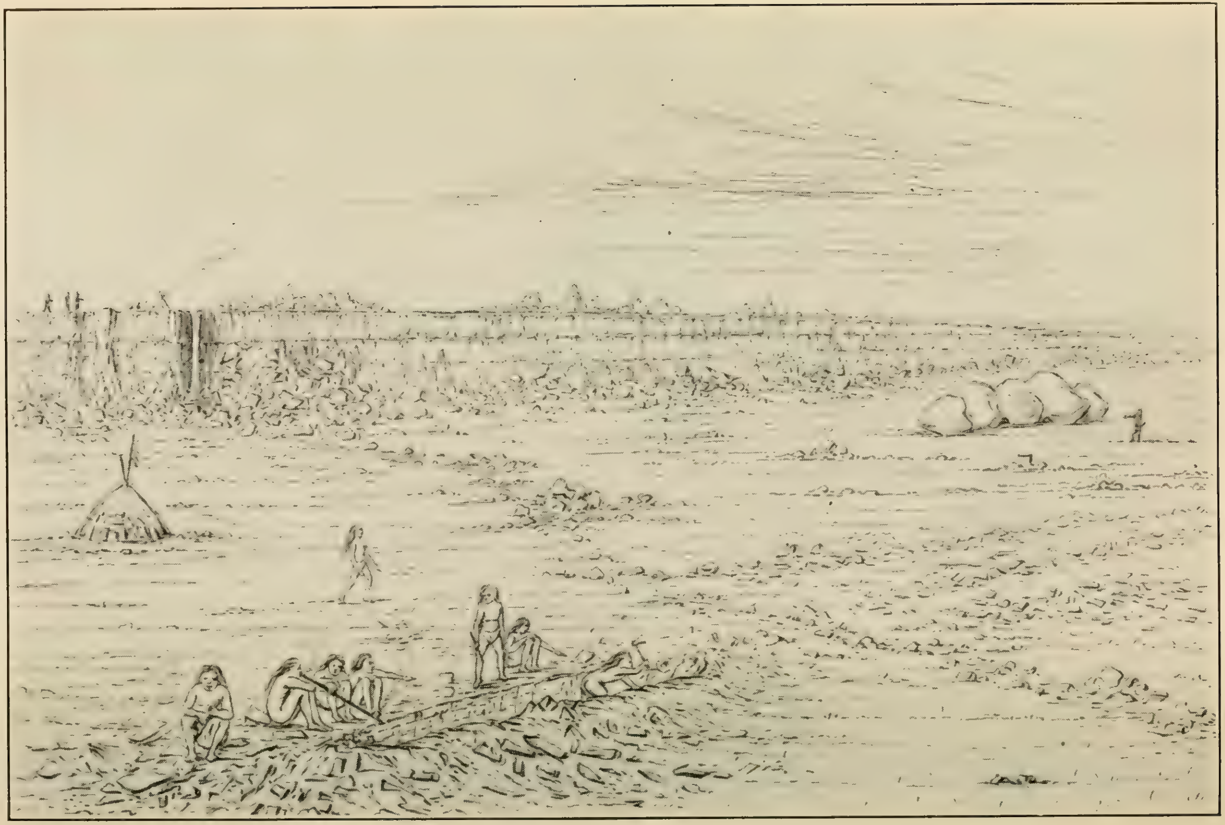

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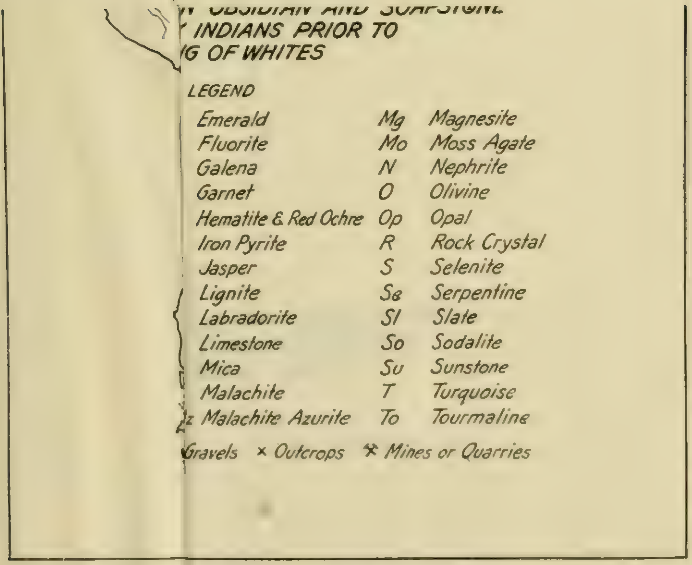
N OBSIDIAN AND SOAPSTONE
INDIANS PRIOR TO
G OF WHITES
LEGEND
Emerald
Fluorite
Galena
Garnet
Hematite & Red Ochre
Iron Pyrite
Jasper
Lignite
Labradorite
Limestone
Mica
Malachite
z Malachite Azurite
Mg Magnesite
Mo Moss Agate
N Nephrite
O Olivine
Op Opal
R Rock Crystal
S Selenite
Se Serpentine
Sl Slate
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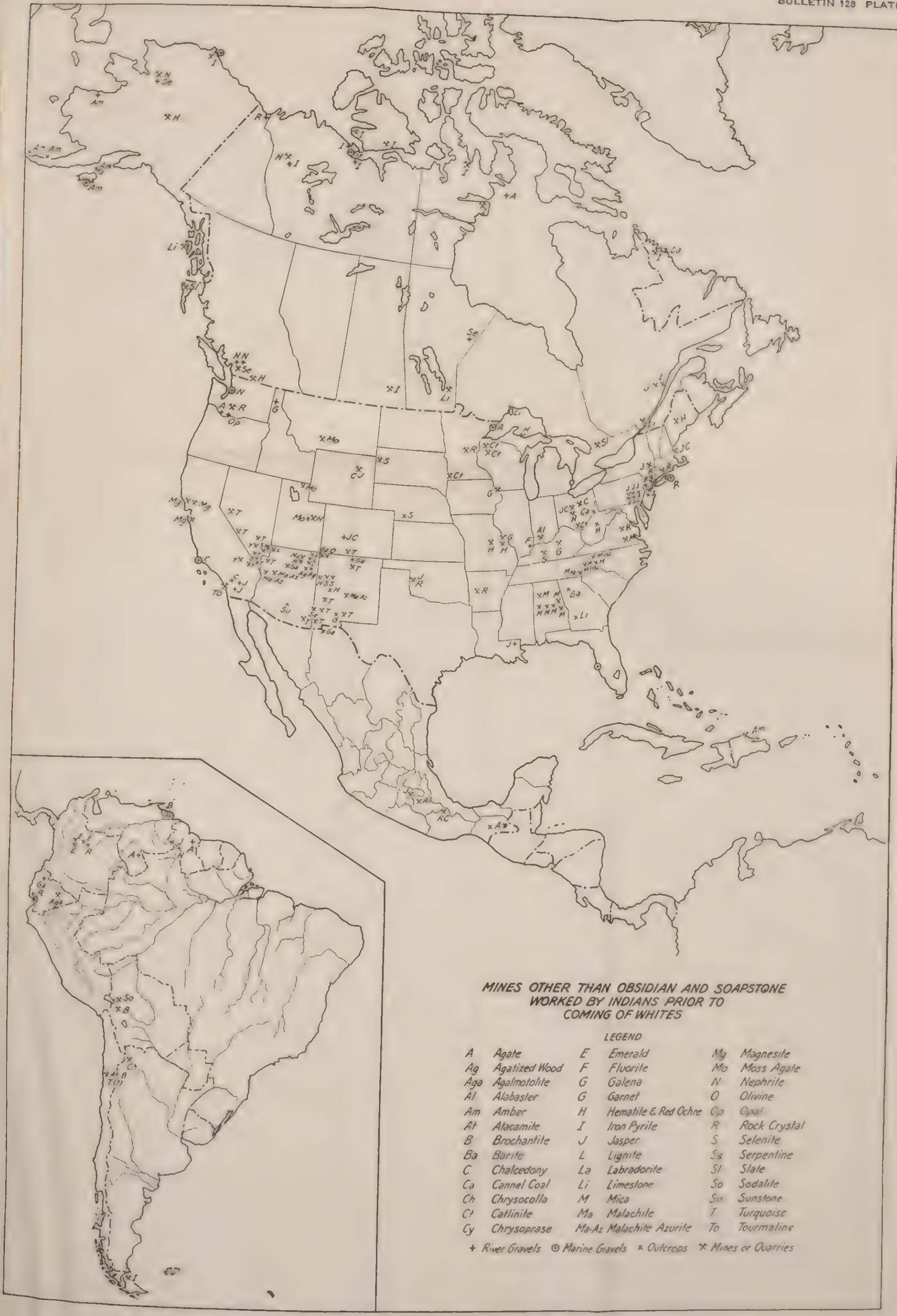
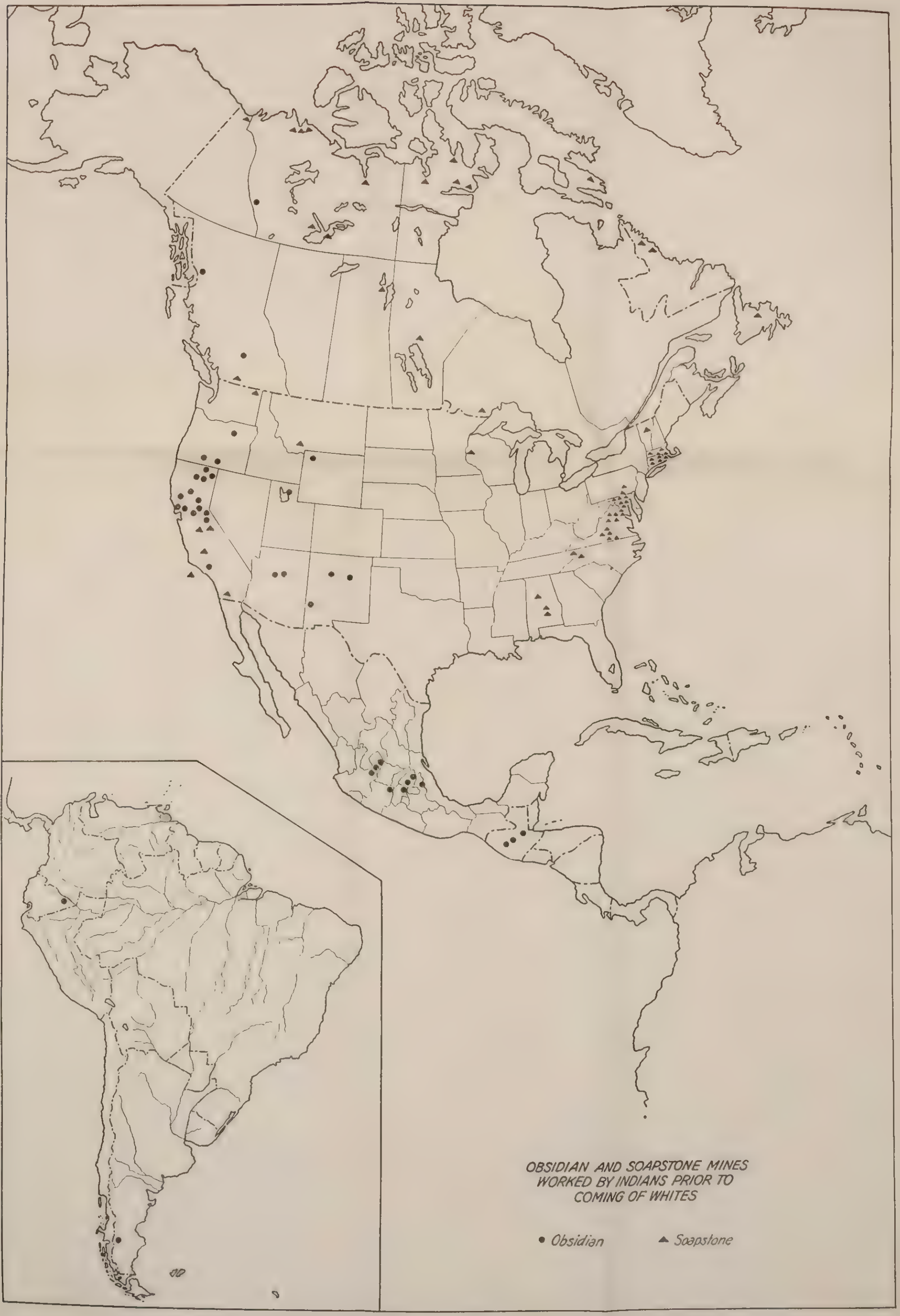

MINES OTHER THAN OBSIDIAN AND SOAPSTONE
WORKED BY INDIANS PRIOR TO
COMING OF WHITES
LEGEND
A Agate
Ag Agatized Wood
Aga Agalmotolite
Al Alabaster
Am Amber
At Atacamite
B Brochantite
Ba Barite
C Chalcedony
Ca Cannel Coal
Ch Chrysocolla
Ct Catlinite
Cy Chrysoprase
E Emerald
F Fluorite
G Galena
G Garnet
H Hematite & Red Ochre
I Iron Pyrite
J Jasper
L Lignite
La Labradorite
Li Limestone
M Mica
Ma Malachite
Ma-Az Malachite Azurite
Mg Magnesite
Mo Moss Agate
N Nephrite
O Olivine
Op Opal
R Rock Crystal
S Selenite
Se Serpentine
Sl Slate
So Sodalite
Su Sunstone
T Turquoise
To Tourmaline
+ River Gravels
⊙ Marine Gravels
× Outcrops
✕ Mines or Quarries

Mines Other Than Obsidian and Soapstone Worked by Indians Prior to Coming of Whites.


OBSIDIAN AND SOAPSTONE MINES WORKED BY INDIANS PRIOR TO COMING OF WHITES
● Obsidian
▲ Soapstone

Obsidian and Soapstone Mines Worked by Indians Prior to Coming of Whites.

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Iroquois Suicide: A Study in the Stability of a Culture Pattern

By WILLIAM N. FENTON

PHONETIC NOTE

The orthography employed in this paper, except where I am quoting others, reduces Iroquois transcription to a minimum of characters required by the economy of the dialects. The vowels: *a* (of English *father*); *α* (of English *but*) which Waugh and I heard in Mohawk; *ä* (of English *hat*); *ε* (of English *met*); *e* (of French *été*); *i* (of French *fini*); *o* (of English *mote*); and *u* (before an *m* closure in Mohawk of St. Regis and (of English *boot*) in Cayuga), I think can be reduced to four: *a*, *e*, *i*, and *o*. They occur frequently in diphthongs and in Seneca less frequently in triphthongs. Nasalization is denoted by a hook beneath the vowel; vowel length by a raised period after the vowel. A raised comma indicates the glottal stop. In Waugh's and Hewitt's transcription, the spiritus asper (ᶜ) occurs, but I have used *h*. The character *š* is *c* (of English *shoe*). *s* and *t* followed by *h* are heavily aspirated. The weakly trilled *ṛ* of Mohawk and Cayuga is related to the *l* series of Oneida. The asterisk * before a word indicates a reconstructed form; similar forms in capitals are so written where the pronunciation is not certain.

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IROQUOIS SUICIDE: A STUDY IN THE STABILITY OF A CULTURE PATTERN

By William N. Fenton

PART 1; GENERAL INFORMATION

Introduction

The problem of suicide frequency, its causes, and methods of commission among the Seneca Indians of western New York became the subject of a brief field study in 1935 when I was stationed on the Tonawanda Indian Reservation for the United States Indian Service. The Indian Office requested information for a survey which Mrs. Elna N. Smith was conducting, and although her interests were the psychological questions surrounding changing Indian life, on which specific data were requested, the general problem fitted nicely my own interests in the remarkable stability of Iroquois culture patterns, and, furthermore, the data illustrated relations between the individual participant and the culture of his group.

Informants on the Tonawanda Reservation supplied the modern cases of suicides occurring within their memory. First, Jesse J. Cornplanter (pl. 6, fig. 1), a nearly fullblood Seneca of middle age, the son of Edward Cornplanter, the speaker of Newtown longhouse, and a Tonawanda mother on Cattaraugus Reservation, related the first case which occurred in the conservative Seneca neighborhood of Jesse's youth. Following service in the World War, he lived at Allegany and later removed to Tonawanda, always living with the conservative longhouse people. Jesse's accounts were checked by Peter Doctor (pl. 6, fig. 2), now in his seventies, one-quarter white from his maternal grandfather. Peter was born and lived his youth at Tonawanda, before he turned Christian and married an Allegany woman and lived at Allegany many years before returning to his birthplace in 1905. He was long a member of the Tonawanda council, and lately has served as pastor of the Presbyterian church. He is a reliable informant of remarkable intellect with an excellent memory and respect for the truth, and being one of the oldest Senecas in full possession of his mind, he represents what the ethnologist hopes for in an informant. I gathered additional notes from William

Gordon who used to live at Newtown before he married a Tonawanda woman with whom he has lived during the generation of his children, 20 years, more or less; he still remains an unyielding adherent to the "longhouse party" who respect his knowledge of tradition. His genial wife, Abbie Brooks (pl. 6, fig. 3), principal female officer for her moiety in the Tonawanda longhouse, volunteered the case about the unsuccessful attempt of her father's brother to take *Cicuta*. Additional information on the medicinal uses of *Cicuta* and mayapple grew out of the extended investigations of F. W. Waugh, of the National Museum of Canada, the late J. N. B. Hewitt of the Bureau of American Ethnology, and my own field work on the Allegany Reservation.

The time perspective of this investigation runs from the recent to the past. Perhaps a bit unorthodoxly, the problem was pointed from the field to the library, rather than the reverse, and, therefore, the cases will be presented in the reverse of chronological order. This corresponds with the original interest in discovering the comparative frequency of suicides in the last two decades and in previous years, and my own interest in the stable character of Iroquois [1] suicide patterns over a period of 300 years, when I readily saw that the first case paralleled in its general framework another case I recalled from the seventeenth century Jesuit Relations (Thwaites, 1896–1901, vol. 57, p. 165).

The library research followed several years after collecting the first cases among the Senecas, and several points have subsequently been pursued in the field and have yielded additional data. I originally attempted to determine the age, sex, degree of blood, and method employed by each participant. Informants generally volunteered the causes, which may not be the real ones, but at least they are the stock excuses supplied by the culture, and I had to depend on them for the scanty data on the personalities of the participants whom, excepting three, I did not know nor had I materials for their life histories, so that the personalities of my informants are more familiar to me than the subjects of the cases.

This paper, written in the spring of 1939, was first called "Seneca Suicide." However, I went to the field soon after and cleared up some of the problems that still remained in the first draft. Josephine Jimmerson, Dwight Jimmerson, and Sarah Snow (pl. 7, fig. 2,) Senecas of Allegany Reservation, furnished additional information on cases 1 and 3; and Charles Gordon, Harvey Jacobs, and Windsor

---

[1] The Iroquois proper were the confederated Mohawk, Oneida, Onondaga, Cayuga, and Seneca tribes occupying central New York. Known also as the Five Nations, they became the Six Nations when the Tuscarora migrated north after 1714. The enemy Hurons of southern Ontario shared Iroquois culture and also spoke an Iroquoian language, but Cherokee and Tuscarora in the south were more distant languages of the same stock. However, the Delaware, Pequot, Shawnee, Algonkin, Micmac, Saulteaux, Sauk, Ojibwa, Ottawa, Miami, and Pottawatomi in the north spoke various Algonkian dialects; the Winnebago and Tutelo spoke languages of the Siouan stock. I have introduced this note here because these tribes enter later into our discussion, and may be confusing to the nonanthropologist.

Pierce, of the Cornplanter Band of Senecas, supplemented the data previously collected on waterhemlock and its uses, and one new suicide case emerged. Moreover, I visited St. Regis Mohawk Reservation, where I worked with Noah La France and Peter Hopps; and at Caughnawaga Mohawk Reservation near Montreal, I found Kate Debeau (D'Ailleboust) (pl. 8, fig. 1) with whom Waugh had worked in 1912. New cases gathered from the Mohawks parallel the Seneca cases, and Mohawk terms bridge the linguistic chasm between Seneca and Huron; therefore, the study is more properly called "Iroquois Suicide." The Hurons of Lorette no longer speak their own language so that they were unable to identify the Huron names for *Cicuta* that appear in the Jesuit Relations, nor did my informants, the daughters of Prudent Sioui of La Jeune Lorette, 9 miles from Quebec, recognize waterhemlock when I pointed it out to them in the field. It remains for future field work among the Oklahoma Wyandots to absolutely establish the Huron uses of the plant. At Six Nations Reserve in Ontario, Simeon Gibson (pl. 8, fig. 2), added cultural and dialectic parallels for the Cayuga and Onondaga Tribes but he added no new cases.

THE PROBLEM

The problem, then, set for this study is to answer so far as is possible five rather elementary questions concerning Iroquois suicides. First, what are the attitudes toward suicide as a value, or how does public opinion regard suicides and what is believed to be the destiny of their souls? Second, what is the comparative frequency of suicides in the present reservation life and in the older Indian life? Third, what are the causes? Fourth, what are the methods? And fifth, to what extent are the current causes, forms, and attitudes cultural norms that have been preserved during 300 years of contact with European cultures? Besides, there is the further theoretical consideration of the relative permanence of pattern as a cultural continuant for custom.

LINGUISTIC EVIDENCE [2]

The Seneca language lacks an abstract term for suicide. While this is typical of Iroquoian languages which generally have few abstract terms, it does show that the act was not frequent enough to cause the progressive reduction of the descriptive verb to an abstract concept. "She has killed herself" (wa'agodadi'·yo'), [the third person singular reflexive form of the verb "to kill" (-di·yo'), recent past], is the usual term for suicide among the Senecas. The third person singular feminine (nonmasculine) form is often made to thus stand for the individual or society. One who is contemplating suicide will employ "I am about to kill myself" (ɛ̨gadadi′ˑyo’), the future form (Cornplanter). When a death occurs through suicide and someone inquires how the person died, the informant simply replies, "she (someone) killed herself" (wa’agodadi′ˑyo’) (Evelyn Pierce).[3]

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[2] The orthography employed in this paper is explained in the Phonetic Note, p. 80.

The terms are similar in the other Iroquoian dialects.

TRADITIONAL METHODS AND ATTITUDES

Suicide was known but informants believe that it was rather infrequently practiced in the old Seneca culture. It occurred often enough, however, for public opinion to be marshalled against it, and there come down to the present day a well-defined method, a set of attitudes frowning on its practice, and some excuses to condone the few cases that occur. Thus, there is a traditional definition of the situation when the proper causes precipitate it. My informants recall a few cases where individuals ate a poisonous herb, indicating waterhemlock, *Cicuta maculata* L. (pl. 7, fig. 1), as the source of the fatal root, and they express a seemingly old repugnance toward suicide as a means of departing this life.

> The old (Seneca) method of committing suicide is by eating the muskrat root which we call o’nǫ́hsɛ̨’ɛ̨. It is a white flowering plant with a tuberous root that exudes a strong, pungent smell. It is eaten raw. It causes rupture of the internal organs and bleeding at the mouth. [Cornplanter.][4]
>
> There is an old belief that anyone who is contemplating suicide by taking muskrat root need not necessarily know the plant, for he can easily find it. [Cornplanter.] The plant is said to call and show itself. You can go right up to it in the dark. It has a strong smell. [Peter Doctor.] The old people say that muskrat root is like any other herbal medicine which you want. They believe that when you want it, it stands up there where it grows calling to you. That is why it is easy to find a medicine which you seek, especially this one with its strong odor. [Cornplanter.]

The Senecas do not use waterhemlock as an internal medicine. Chauncey Johnny-John pointed to it growing by the spring behind his house in Coldspring, Allegany Reservation, saying, "the root looks like a radish and is poison; it is not used for medicine.[5] It will kill you in ten minutes." When I showed the root to Josephine Snow, she said, "Women used to think it was poison, and my mother said the women used it to commit suicide." Her sister, a noted Seneca woman herbalist whose grandmother had taken the root, knew it. "It has a white flower. It is poison, and it does not mix with any other medicine. It is good for nothing [internally]." (Sarah Snow.) Another Seneca woman from Cattaraugus said, "I am afraid of it. Mother always said it was poison." (Josephine K. Jimmerson.) Other Seneca men seemed afraid of the plant (Charles Gordon and Harvey Jacobs, of Cornplanter Reservation), but they all know it makes an effective poultice for dislocated joints. (Windsor Pierce, Cornplanter Reserve.) One informant remarked that it frequents graveyards, and he knew of a ceremony which was performed at Cattaraugus on the fourth night of the new moon to ask its help for strengthening some other remedy. A priest goes into the cemetery, clears the brush away, and builds a fire near the stalk. He offers tobacco and asks the plant to lend its strength to the medicine, but he does not use the root.[6] (Windsor Pierce.)

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[3] Miss Evelyn Pierce, Assistant Guidance Officer, Office of Indian Affairs, went over the Seneca terminology with me at the time of writing (1939), and confirmed Cornplanter's statements.

[4] This plant, which has similar names in the several Iroquoian dialects (see p. 113), was collected on several occasions independently by F. W. Waugh and myself, and it was identified by informants and competent botanists (Prof. William P. Alexander and Dr. Robert B. Gordon, of the Allegany School of Natural History, and E. C. Leonard, of the U. S. National Museum) as the "fatal root," waterhemlock, *Cicuta maculata* L.; and only once did an Iroquois confuse it with another plant, although some Senecas consider that hairy Angelica, *Angelica villosa* (Walt.) BSP., is the female of the species, while others say Queen Anne's Lace, *Daucus carota* L. [introduced], is in the same family. The Indian descriptions of its form, structure, and properties are fairly consistent with the facts established by modern research. (See Muenscher, 1939, pp. 170–173; Marsh and Clawson, 1914; Pammel, 1911, pt. 1, p. 49, pt. 2, pp. 652–656.) The root when cut exudes an aromatic oil of peculiar odor which contains a resinlike substance, *cicutoxin*, but the leaves and fruits may be edible at certain seasons without poisoning. Even a very small quantity of the root produces fatal poisoning—a piece of root the size of a walnut will kill a cow. The symptoms of poisoning in man are: "pain in the stomach, nausea, sometimes violent vomiting, diarrhoea, dilated pupils, labored breathing, sometimes [bloody (Pammel)] frothing at the mouth, weak and rapid pulse, and violent convulsions. If free vomiting is promptly produced, the patient is likely to recover" (Muenscher, 1939, p. 173).

Another Seneca informant remarked:

> That plant is poison. All the Indians—every nation in western New York and Canada [the Iroquois tribes]—know that that plant is poison. They all know that Indians have taken it to commit suicide.
>
> That root will take effect immediately. They die in 2 hours. I know of no antidote that will counteract it.[7] A teaspoonful of the root will kill a man. I have tasted it and spit it out, and it does not taste badly. There is nothing good about the plant [and this informant does not even use it as a poultice]. Those who eat it die in 2 hours. It must be a painful death. It twists the arms and ankles and turns the head back. Finally they die in a last wretching convulsion. They say it turns the eyes back. They turn in awful shape.

He had never heard that the plant grows on its victim's grave. "There is no compulsion about the plant. Unless you want to take it, it will not make you." (Dwight Jimmerson.) Dwight scouted the idea heard from other conservatives that the plant "grows inside the head of its victim until he takes it and then it comes up later from his grave." (Cornplanter, David Jack, and others.)

The Cayugas of Six Nations Reserve in Ontario call waterhemlock onasʿϵ̨' and the Onondagas there call it onasϵ̨́'ϵ̨'ʽ (Simeon and

---

[5] Herbalists throughout the Six Nations know that, although waterhemlock root is a deadly internal poison, the smashed root makes a powerful drawing poultice for quickly reducing swollen joints, particularly ankles, and for relief in cases of rheumatism and arthritis, but they caution against leaving the poultice on too long lest it draw out all the fluid leaving a stiff joint. This use is recorded for the Cayugas, Onondagas, and Mohawks of Six Nations Reserve, Ontario; the Mohawks of St. Regis, Caughnawaga, and Oka (Two Mountains Iroquois) in Quebec (Waugh, 1912, 1914; Fenton, 1939), the Senecas of Cornplanter, Pennsylvania, and of Allegany, Cattaraugus, and Tonawanda reservations in New York (Fenton, 1935, 1938, 1939); and by a savage at Missilimakinak around 1720 (Lafitau, 1724, vol. 2, p. 369).

[6] James Crow of Newtown, Cattaraugus Reserve, is reputed to know this ritual, but I have not had it from him directly.

[7] He was very much interested when I read him the account in Muenscher, 1939, p. 173, after he had described the reaction so closely.

Jemima Gibson), but my informants were unable to analyze the terms. They know it is poison to take, but there have been no recent suicides there, and they only know that a woman on one of the Seneca reserves in New York (case 1) took it. Gibson thought it a wicked thing to take one's life because Handsome Lake had said that suicides are deprived of a place in the hereafter; that it is as bad as murder. Nevertheless, Waugh's data of a generation ago say that these people believe waterhemlock compels the potential suicide to seek it, and that contrary to the usual attitude of medicinal herbs that stand willing to respond to man's call for assistance in curing, this one is willing to destroy him.

> A preacher in the longhouse will say that it [the plant as symbolic of the sucide fixation] will grow in your head. By this is meant that it is willing to kill you . . . When eaten it will make a man crazy; he will die shortly. When the root is chewed and swallowed [it is believed that] it becomes whole again within the stomach. [David Jack; Waugh, 1912, No.4, p. 13.]

Furthermore, we find the belief among the Mohawks that not only does the root of waterhemlock re-form within the stomach but that it subsequently grows upon the victim's grave. The Mohawks of St. Regis, Caughnawaga, and Oka in the St. Lawrence Valley know waterhemlock as o·nasą·′ṛa (St. Regis and Oka) and onáhsaṛT (Caughnawaga), meaning "whitish feather" or "white plumed"—a name given to the umbellate blossoms so characteristic of the plant (pl. 7, fig. 1). They all use the root as a poultice, and fear the danger of taking it internally. Katie Debeau related to Waugh and me at intervals of 27 years the tragic case of two little St. Regis children.

> A brother and sister followed their father who was plowing new land one spring of the year. The plowshare turned up some roots which they picked up, washed and ate without knowing what they were. When the parents realized that the children had been poisoned, they tried every possible means to get them to throw up, but they failed and the children died from the effects. Later on, after they had been buried, the plant grew up on their graves.

This was evidently one of those unfortunate spring accidents that recur infrequently wherever the plant grows. Katie recalled a second tragedy which occurred at Caughnawaga; it points a moral to the Iroquois habit of tasting roots to identify them when collecting medicinal herbs. "A boy and his brother here were looking for medicinal herbs. They had been instructed to procure a′dja· (*Dentaria dyphylla* Michx.) [which has a peppery taste], and they ate the poisonous root by mistake." (Kate Debeau.)

The use of waterhemlock as a suicide poison has been recorded for all of the Six Nations, excepting the Oneidas, and including the Tuscaroras, the latest settlers in the North.[8]

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[8] Hewitt's manuscript, "31 remedies for disease," (Tuscarora ms. No. 435, Bur. Amer. Ethnol., 1888) lists, "14. For the commission of suicide it was customary to eat a piece of the root of Spotted Cowbane (o'nă-sĕn′-ä') . . ., *Cicuta maculata.*"

THE CONCEPT OF ALLOTTED LIFE

The concept of the allotted life span and the view of natural death as the departure on the long trail leading westward to the spirit world marshals Seneca public opinion against suicides. The conservatives still believe that a man has an allotted number of days which the Creator sets for him to live. When his time comes, whether he be abroad hunting, at home in bed, or down sick he will go regardless of medicine, science, or the persuasion of his relatives. The followers of Handsome Lake, the Seneca prophet who preached 15 years following 1800, believe "the events of all our days are foreknown" (Parker, 1913, p. 49), and they repeat in the funeral address the Creator's message to the prophet:

> When you, the beings of earth, lose one of your number you must bury your grief in their grave. Some will die today and some tomorrow for the number of our days is known in the sky-world. [Parker, 1913, pp. 57, 108.]

Some speakers make a special plea to the surviving relatives to take their minds off the deceased lest the fixation lead them to neglect their dependants or destroy their own lives (Henry Redeye).

> And our belief is that for anyone who will destroy his own life, his spirit will always be earth-bound (dedwadi). My father [Edward Cornplanter, speaker and ritual holder in Newtown longhouse who recited the Code of Handsome Lake to Arthur C. Parker] used to say that the spirit [of a suicide] will just wander around where the [waterhemlock] plants grow, and it will always be expecting another person to follow its example. Indians [Senecas] believe it is a sin (gaiwane''akshe') to take one's own life, to shorten the span of days which the Great Spirit has given to each one of us; therefore as a punishment he shall not go on the path to the spirit-world, but shall always remain on earth among the plants which he took for death. [Cornplanter.]

To guard against seeing one of these earth-bound spirits people drop their curtains at dusk or pin up a white cloth or newspaper at the windows. They warn the children not to look out, partly for discipline, and partly lest they see one of these hungry earth-bound souls peering in after some food (John Jacobs).

> A maple leaf is the thickness of the partition between us and the dead. A person who has died of violence—witchcraft poisoning, suicide, and murder—remains earth-bound until judgement day. [Handsome Lake by Cornplanter.]

These foreshortened souls are conceived as wandering about the scenes of their crimes, and they remind the living of their passage by mysteriously opening and closing doors.

Occasionally the dead appear to the living during dreams to request food, or a song; the surviving clansmen should placate the ghost by sponsoring the great feast of Chanters for the Dead ('ohgi·'we), because the dreamer might become sick and follow the relative, or, it would seem, there is danger that he might willfully take his life in a vain effort to join the deceased in the land of the dead.

My informants believe that there are fewer suicides among the Indians than among the whites, and this it seems is because the causes are fewer, although they cite the sanctions imposed by belief in the destiny of souls. We shall examine the possible extent of these beliefs into aboriginal culture when we have presented the cases, for it is likely that the bulk of them are aboriginal and antedate the coming of the Jesuits and Handsome Lake who borrowed Christian morality and sanctions to bolster up a basically native religion (Wolf, 1919, pp. 59–65).

> My father always said that our mind, or will power is stronger than the whites', and, therefore, we overcome those trifles under which they break down. We look upon life [death] with the prospect of an everlasting life beyond the grave, and we have no desire to forbid ourselves the path to the spirit-world. [Cornplanter.]

Holding these beliefs and values has not prevented one Seneca from entertaining suicidal thoughts. According to his wife, he once threatened to kill her and then kill himself, and, fortunately, in a drunken shooting episode he was lucky enough not to hit his wife's brother and bring himself to the position from which suicide might be the only easy exit. On a previous occasion he told me that after his regiment demobilized in 1918, he was considering jumping over the falls of the Genesee River at Rochester when an officer accosted him and persuaded him to spend the night at the station house.

The modern Iroquois commit suicide for two principal reasons that appear in the following case studies. Women who have been mistreated in love affairs or marriages in most instances revenge themselves by taking poison and thereby bring critical public opinion on the head of the abusive male consort. Men who think that they have committed some violent crime and have lost face put an end to themselves to escape revenge or apprehension. Their suicides are most apt to be violent. The first type of case is the one which the Iroquois condone and most frequently, mention.

> The only cause of suicide with us [Senecas] would be a love affair or marriage (ganǫhgwa') [the same term is used for both], or a broken and unhappy marriage. [Cornplanter.]

Child suicides, to escape restrictions or in revenge of punishment, and the few cases of suicide among the chronically ill are mentioned infrequently.

Iroquois suicides fall more surely into two fundamental types based on a formal method of commission. Here the ethnologist is on safer ground than when he is discussing causes and motives which cannot always be established after the fact. Type A are the cases of root poisoning, and type B are violent cases. The cases bear out the Iroquois who say that the type A cases are apt to be women following broken love affairs, whereas the type B cases are most apt to be men who seek to escape the consequences of violent crimes or loss of status.

Besides, there is a group of miscellaneous cases. We present all of the modern cases and then the earlier cases from the literature, proceeding upstream historically.

PART 2: CASES

MODERN CASES

TYPE A CASES: POISONINGS

Case 1.—Josephine L., a full-blood Seneca woman of middle age.

About 1902–3 there was living at Newtown on the Cataraugus Reservation a woman we shall call Josephine L. "She was one of those Seneca women of regal bearing whom I remember used to live at Newtown" (Cornplanter, my younger informant, was a small boy at this time). She was a fine looking woman, and she was probably nearly a full-blooded Indian (Peter Doctor).[9] Her husband came from Allegany (P. D.), he was a much younger man (C.); and while he was visiting at Newtown, they went to living together in her house, and it seems that he had been living matrilocally with her at the time of her death. "He caused her a lot of worry. He was undecided about her, and he was teasing her," and my informant implied that he had made her feel his interest in other women (C.). Much of this is undoubtedly imputed Seneca behavior, but as such it is interesting cultural data.

> As the result of a quarrel she went to the woods, unknown to the others, where she secured and ate the fatal root. She got home and died quickly after her arrival. They say she went into spasms—she had convulsions—and that witnesses heard noises in her vitals. She emitted blood from her mouth as if she had burst internal blood vessels. [C.]

Jesse Cornplanter was in district school at the time, "and when they heard she had died school was dismissed. Many were taken with the strangeness of her death and came to the funeral. Many wondered why she had reached a state where she could take her own life. It was discussed a great deal for many years."

Undoubtedly, my informant gained his knowledge of the attitudes toward suicide current at this time from his father who was well versed in Seneca traditions. It is also evident that the case of Josephine L. made a strong impression on him, and that the Newtown community was stirred by the event. The news soon spread to Allegany and Tonawanda. It was one of those rare occurrences that a community recalls as happening infrequently but for which there was a well-defined pattern of behavior.

There are other versions of this case, differing according to locality. My Cayuga informants had heard of the affair, but they were unfamiliar with details. However, at Allegany thec ase is better known among the Senecas. Dwight Jimmerson of Bucktooth (West Salamanca), in Peter Doctor's generation, remembers the following story about a suicide at Newtown, Cattaraugus Reservation, about 1900, and he thinks it may concern the case of Josephine L.:

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[9] Probably all recent Seneca generations have carried some white blood. I have no genealogies going back over more than four generations which do not reveal a white ancestor. What Doctor means is that not knowing any white antecedent in her pedigree, she appeared to be all Indian.

> At Cattaraugus Reservation in the Newtown longhouse community a young man and woman got together as man and wife, and they were living that way. It came fourth of July and the man wanted to go to Buffalo where there was to be a celebration, and his wife also wanted to go, but he did not want to have her with him. He knew the time that the train would leave the nearby Lawtons depot, and they walked toward the depot, and she was still teasing to accompany him. Not willing to give in, he stalled along leading her as far away from the depot as he calculated he could dash for the train, which only stops there briefly since Lawtons is a small station. When he heard the train coming, he sprinted for the depot. He made the train, but she could not run fast enough and was left standing breathless. She turned around and went into the woods and procured and ate the root of waterhemlock. She barely reached home when she died.

Case 2: A supplement to case 1.—Louisa S., niece of Josephine L.

William Gordon, who knew *Cicuta* by its Seneca name both as a reducing poultice for sprains and as a suicide poison, gave the following supplementary information on the case above:

> Louisa S. [whom] we called Ska′˙di’ at Newtown [William's wife's nickname] took that medicine. It is poison. It grows on wet ground. She was married once and she got mad and thought she kill herself. She was still [a] young woman when she took it.
>
> Now a year later and her aunt [mother's sister], Josephine L. [case 1] took it. Alfred L. is her brother and he is now living at Cattaraugus.

This informant thinks that Josephine L. "went to the woods," procured the poisonous root, and did not take it until she had returned home and entered her house. Both Cornplanter and Gordon agree on the immediate cause of her suicide: "*She must have been jealous of another woman.*" They said that this trait is apt to run in families.

Josephine K. Jimmerson has heard her mother tell how the deceased Ska′˙di’ (ska·di’géǫk) took waterhemlock, but she attributes the act to fear of blood revenge.

> Mother always said it [water-hemlock] was poison. Ska′·di’ who took that lived across from my mother at Newtown. They drink it, but I do not know whether they take it raw or boil it. I am afraid of it. There was another case about the same time. Her sister, Hattie, took it. Something was wrong. They had a big quarrel around the neighborhood during which they murdered someone. Then they killed themselves before they could be punished.

Since this informant is both very deaf and quite feeble, I could not press her for additional details which she did not seem willing to volunteer.

Case 3.—Abandoned Seneca mother takes waterhemlock, *circa* 1885.

Josephine and Sarah Snow of Allegany relate how their mother's mother was abandoned by her husband (their mother's father).

Another woman took her husband away from her when their mother was a baby just walking at her side, and she became angry and ate the root. This happened along the Allegheny river, Sarah calculates, in 1853 because her mother was 20 when Sarah was born in 1871. Both women had the story from their mother who learned about it later.

> She went after water and on her way she pulled that plant. She got the water all right, and on her way back she ate the root which she had washed at the spring which was quite a distance from the house. On the long carry she started puking blood [here Sarah rolled her hands from her stomach upward to her mouth to illustrate vomiting], and she fell by the way. Some men who were working in the garden nearby saw her fall and rushed over. In her body she was having cramps and she soon began having convulsions. She was dead by the time they reached her. She was buried from the longhouse. [Sarah.]

She received a regular funeral and burial, and Sarah had never heard that the plant grows out of the victim's grave. The attitude of both women is that their grandmother had revenged herself of her husband's adultery, and though not especially proud of the suicide in their maternal family, Josephine had originally volunteered the information to me one day at breakfast, and neither sister seemed loath to discuss the affair.

Case 3a.—Mary J., abandoned by her Seneca lover, *circa* 1889.

Dwight Jimmerson gave me this case in the summer of 1939; it was one that he remembered vividly as occurring in the Allegany community during his youth.

> I knew these people well. George G. was older than I and he was going with Mary J. Both were Allegany Senecas. Finally they had a falling out, and he went home in the night telling her that he was leaving her for good, that he would not return. The following morning she went out and dug up the root of o’nǫ̇’’shɛ̨’ɛ̨ [*Cicuta*] and ate it and died.

Apparently, Dwight's knowledge of how the poison affects its victims came to him from this case. (See p. 87.)

Case 3b.—Neglected Mohawk wife takes *Cicuta, Circa* 1850.

Katie Debeau of Caughnawaga, with whom I worked in 1939, recalled one case of suicide among the Mohawks that occurred within her grandmother's time. This was presumably in the Catholic settlement near St. Regis.

> In the family living neighbors to my grandmother the husband was not supporting his wife. She became discouraged and told my grandmother that she intended to fix up a medicine to take, and only God knows whether it is a cure or a kill.
>
> That same evening the little girl of the family came running over to tell my grandmother that her own mother was very ill. So my grandmother, who was a great herbalist, prepared herself with different kinds of roots from her stock and went over to see her neighbor.
>
> When she arrived, she asked, "Where is the pain?" "All over my insides," her neighbor replied.

> She did not last but a very few minutes before she died. Whenever my grandmother would lift the woman to give her some medicine or water to drink, she would sigh and breathe a strange odor. Her eyes blinked and dilated rapidly, and she had difficulty swallowing. The odor she breathed was like liquor, and all around her mouth was black. She died a terrible death—she finally suffocated.
>
> The next morning when my grandmother looked around the house, she discovered the remnants of the root and the stalk of o·nasα'ˀa [waterhemlock] that had been cut away. She broke the root in twain and it gave off the same odor that she had detected on the breath of her poisoned neighbor.

Katie claims to know an effective emetic for cases of *Cicuta* poisoning.

> Take fresh cream and a pinch of baking soda and some sugar. Mix it and give it to the patient. Then turn the patient on his stomach and roll him and massage the stomach to mix the medicine in the stomach. They will throw up. If they throw up they will recover.

Witnesses said that Katie had cured a child who had accidentally taken "Paris green" that his father had prepared in solution for bugging potatoes. This poison produces violent diarrhoea, she said, and ultimately death follows. Katie used the above treatment and employed a feather to induce vomiting.

Case 4.—Elijah Brooks who was saved from *Cicuta* poisoning.

The following case is exceptional because it is the first of two modern cases of Seneca males attempting poisoning. Abbie Gordon (Ska'·di') recalled that Elijah Brooks, her father's brother, took *Cicuta* but he did not die. Somebody discovered him and doctored him quickly, giving him a large dose of mashed boiled beans (as an emetic(?)). Abbie did not know the cause of the attempt, and she seemed unwilling to discuss it further. Elijah died somewhat later of natural causes. (This case should be read in connection with case 12 of my informant and her daughter who wanted to die.)

Case 4a.—Informants of the Cornplanter Band of Senecas in northwestern Pennsylvania identified waterhemlock, which grows along the flats near the Allegheny River, as the fatal root which they call o'nǫ́''shę'ę, which they think means, "it looks like onion." (Charles Gordon, Harvey Jacobs, Ezra Jacobs, and Windsor Pierce.)

Charles Gordon's mother used to relate how a Seneca outlander, i. e., a Seneca from up the river or from Cattaraugus who is not a descendant of Cornplanter, came there to stay. "He came here to get a wife, and someone else got her away from him. He poisoned himself with this plant which you see here." [10]

This case interested me because it shows that one Seneca male was unable to endure the shame and ridicule that would follow losing a mate to another suitor. I recall one young man of Allegany who brought home a young Cayuga bride and soon lost her to a neighbor whereupon even his own father remarked that his son had just rented her for a while. However, in this case the youth soon acquired another wife from the same community, and his unsuccessful affair is no longer mentioned.

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[10] At this particular sitting, my informants identified the suicide root from the illustration (fig. 54.—*Cicuta maculata*) on p. 171 of Muenscher. The following day we collected a specimen, which was independently identified by another informant.

While writing this paper, two type A cases that occurred near Onondaga were related to me by Earl Jones, a young Onondaga-Mohawk employed at the Smithsonian Institution. Similarly, both cases are of young women who found the adjustment between reservation culture and city life difficult, and both cases involve lovers. One young woman recovered. The other was an

> Oneida girl living with an Onondaga man. They had been to the nearby city of Syracuse, and returning to the reservation a little drunk they got into an argument. This continued after they entered the house. She went to the cupboard and drank the contents of an ammonia bottle. Her "boy friend" said afterward that she habitually took medicine, that she had been drinking this night, and that in the dark she had grabbed at a bottle, the wrong one. That was his alibi.

Earl Jones has heard of a poison root that was anciently used at Onondaga for suicide. He recognized Cusick's O-nah-san-a (*Cicuta maculata L.*)[11] as probably o'ne'sä′·na', which is close to the form Hewitt gives in Tuscarora (footnote 8, p. 88), but he does not know the plant. However, he suggested it should be a poisonous plant because the modern Onondaga apply the same term to poison ivy.

Jones believes that Onondaga suicides were formerly less frequent, and they are certainly of less frequency than the cases he cited of whites who had married on the Reservation and among the neighboring city dwellers.

TYPE B CASES: VIOLENT SUICIDES

Male suicides among the modern Iroquois are apt to be violent. Thinking they have committed a violent crime, they seek a violent end as an escape. In three of the following cases a jealous husband killed his wife and then killed himself to avoid blood revenge or criminal prosecution. One gains the impression from talking with informants that he killed himself out of self-pity. The basic information in these cases came from Peter Doctor.

Case 5.—Albert S., an unsuccessful-spouse suicide, 1925.

Albert S. of Tonawanda Reservation, got very drunk and shot his wife Phoebe early on the morning of December 7, 1925, and then shot himself in the head. Phoebe died the following night, but he lived to be tried for murder and sentenced to the Atlanta jail, where he died May 29, 1928.

Although Phoebe is survived by three sisters and two brothers (1935), I acquired no information about the motives, other than the bare facts and that he was drunk, which seemed sufficient to my informant.

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[11] See Beauchamp's notes appended to Pursh's Journal of 1807, p. 75.

Case 6.—Hiram Redeye, an unhappy-marriage suicide, *circa* 1900. Perhaps the most famous suicide is the case of Hiram Redeye, of Coldspring on the Allegany Reservation, who hurled himself under a passing freight after beating out his unfaithful wife's brains with a trackmaul.[12]

Hiram Redeye, whom we nicknamed swé′ ʼnǫ, father of Newman and brother of Amos, lived at Coldspring around 1900. He was a great athlete, an especially talented runner and baseball player. He used to live with Phoebe Cooper, widow of Solon Jimmerson, of Jimmersontown [a settlement on the bank of the Allegheny below Salamanca]. After the death of her husband, she stayed with her brother, Hiram Cooper, at Coldspring. It was here that she met Hiram Redeye, and they went to living together at Hiram's house.

Hiram was abusive, he licked his woman, Phoebe, and he frequently threatened her life. He had a jealous disposition.

Another informant ventured that she was unfaithful, and, whatever the fact, Hiram believed the rumor.

Phoebe finally despaired and went back to her brother's, to the house of her clansman; and while she was living there Hiram went over repeatedly and begged and coaxed her to come back to his house. However, she did not in the least want to return, but her kinsman kept urging her to make up with her consort, saying that everything would probably be all right from now on. [Peter added parenthetically, "the old folks [parents and relatives in upper generations] usually try to patch up these broken affairs, just as they formerly selected mates for their children and arranged the weddings with the opposite parents."] But Phoebe wept and carried on because her folks insisted that she return with Hiram.[13] Reluctantly, she packed her few clothes, her sewing, and a splint basket she was working on. In going she remarked, "If anything happens, it will be up to you [you will be responsible]," meaning that her relatives were responsible for her fate.

They started out single file, Hiram going ahead. [It was customary for a man to walk in front of his wife.] She looked back again and again as they went along the path until finally, stopping to take one last longing look, she turned and followed.

When they arrived at Hiram's house, he opened the door and they went inside. She set down her burdens. Hiram locked the door and seized a hammer, a small track walker's maul with a short handle. Then he went after her. "You did not want to come back," he said, and he accused her of having had illicit relations with Jonas Titus. He was jealous of his neighbor, Jonas. She cried, "No," saying that she had had nothing to do with Jonas, but he refused to believe her. He struck her on the head, and in his fury hit her again and again until her skull was completely crushed. [A Coldspring informant states that he also cut her throat with a butcher's knife.]

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[12] To appreciate the setting the reader must understand the fascination which the railroads hold for the New York Indians. Wherever tracks cross the reserves, the maintenance crew is apt to be composed of Indians. They take to this work with enthusiasm, although they may speak little English besides the railroad jargon; and the central factor in the modern life of Coldspring is certainly the Erie Railroad complex: the dinner pail, overalls, caps, gloves, and the worn circle in the pants pocket indicating the presence or absence of the snuff habit. To the rest of the community the trains have brought, with railroad watches, a sense of time, and the tracks serve as a berrying ground, a highway up and down the river, and a sure but dangerous way home on foggy Saturday nights. It is impossible to tell what proportion of the frequent deaths during 50 years to Indian trespassers have been accidents to homeward-bound travelers, deliberate murders, or suicides.

[13] This narrative has the ring of truth. The facts and causes of marital rupture and the attempts of the relatives to mend it agree point for point with cases of brittle monogamy which I have observed since 1933 on the Seneca Reservations. No sooner does the wife seek sanctuary in her clansman's house, because her husband has beaten her or jealousy has induced a quarrel, than he is there the following morning teasing her to return. Unless one of the mates absconds "to play house" with another lover, a few days of isolation serve to draw the breach together until the next incident arises.

Then he opened the door and set out on the run through Coldspring settlement toward the 'nip and O' tracks [N. Y. P. & O. R. R., which has since become the Erie]. A west-bound freight train was coming down the valley, and he made for it. The train beat him to the crossing, but he cast himself under the wheels. I remember the details of this case because Phoebe Cooper was of my wife's relations.[14] [Peter Doctor.]

Case 7.—Sam Parker, who hanged himself, *circa* 1875.

"Sam Parker of Tonawanda Reservation hung himself because he thought he had killed two people." Peter Doctor remembers the event clearly as happening either in 1874 or 1875, as he was in district school on Sundown Road at the time.

Sam Parker, Peter supposes, was a full-blood, and he was around 50 years old but still active; he was still playing lacrosse and engaging in other equally violent exercise. He came of a remarkable family, being the son of Levi Parker, who was related to General Ely Parker, and his was the only suicide in that family known to my informant.

Sam Parker stole a horse belonging to his sister, Clara Parker, and he sold it somewhere off the reservation. His sister persisted in her search and finally traced it. A man from Tuscarora stayed here at the time, and Sam's sister acted as his interpreter as they searched together from farm to farm among the whites. The Tuscarora finally located the horse, and the sheriff returned it to its original owner because it was stolen property. The man who had purchased the horse described the seller and thief as Sam Parker, her own brother.

When Sam knew he had been discovered he went after his gun.

The tragedy below happened before the West Shore Railroad went through in 1882. Peter does not remember the sequence, but he thinks that the shooting at the sister came first, and then Sam went after the Tuscarora.

The first shooting occurred toward the east end of the reserve at William Charles' house. Clara Parker, the sister, lived there; she was the present William Charles' aunt and Charlie Moses' mother. When Clara's mother and brother saw Sam approaching carrying the revolver, they hid Clara in the bedroom. He entered, and not seeing her, suggested she might be hiding in the bedroom. They attempted to block the door, but he shot through the wooden panels. Clara [who Peter says had a bad temper anyway, and adds that she was probably angry] screamed from within the bedroom, and Sam fled supposing that he had killed her.

Next he went to the house where he knew the Tuscarora man was staying. This was at Seavor Blackchief's at the time when the old people were still living. (Seaver's mother's brother had migrated to Tuscarora [where he had married], and a while afterward he returned. Therefore the Tuscarora man was staying with them.) Sam went to the house inquiring for the Tuscarora who was upstairs. As the Tuscarora emerged at the head of the stairs, Sam shot from where he was standing near the door. And again, thinking that he had hit him, he fled.

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[14] I gathered from Peter Doctor that the couple made such a din that the close neighbors were attracted to hear the shouted accusations and denials and that they saw part of the struggle. Much of the tale seems to have been reconstructed after the crime, and the years have not cramped Peter's skill as a narrator, although I have never had cause to doubt his veracity.

Sam's mother and sister and wife came running after him, but he went into the brush to the south of the present railroad track near McRae Skye's place. Before they overtook him he had shinned up a leaning tree of nearly 2 feet in diameter. He was sitting on a limb with a rope tied around his neck and was busy tying the free end around the limb when the women came up. They told him he must not take his life, but he jumped anyway in full conviction that he had killed two people. He never hit either of them.

We school children heard of the tragedy and the school teacher let us off to go over and see him.

It is possible that the motive in Sam's suicide was shame at having been caught in a theft rather than fear of revenge or prosecution.

Case 8.—Jealous husband hangs himself after ambushing wife and lover.

Peter Doctor remembered one other case which occurred at Cattaraugus Reservation about 1890. A jealous husband lay in ambush at the hill leading out of Gowanda. His wife must pass that way returning home in her lover's wagon. He shot at her as the horses slowly climbed the hill, and thinking that he had killed his wife, he hung himself shortly afterward.

Case 8a.—Sometime during the spring of 1939 while I was writing this paper, one of the Sachem chiefs whom I had known during my stay at Tonawanda hanged himself in his attic. I did not know him very well. During the time of our acquaintance he was frequently drunk and he kept pretty much to himself. A rather fine speaker and an exceptional singer, he seldom appeared to discharge his duties at the longhouse festivals, and he did not fraternize with the mutual aid singers' society with whom I used to meet at Jesse Cornplanter's. He did belong to another group of singers, but they seldom made public appearances at the longhouse dances. He had attended Carlisle Indian School where he had run the 100 yards in 10 seconds, and he had played considerable baseball after returning to the reservation. He lived in a little log cabin with a wife, who occasionally got herself very drunk, and they had several small children.

A competent social worker, who knew him better than I did, had seen him intoxicated several times, and each time he had a crying jag. He wept a good deal begging her not to take him home, until she had straightened matters with this wife. The social worker had his confidence for he would regain control of his emotions when she agreed to intercede for him. It is perplexing just why he worried about his wife's reactions since she was so given to drinking herself.

It is reported that several times when he was drunk he had threatened to hang himself. It probably got to be an old story, and no one took him seriously. He used his own attic for the occasion. He had been working regularly at the Tonawanda Community House [which was then being built by Indian labor under

WPA], until shortly before [his suicide]. He seemed to be in no difficulties previously or [at the time of his demise]. [H. A. Wayne, correspondence, 1939.]

He had an Indian funeral of the longhouse variety and his clansmen held the regular feast to thank the participants 10 days after.

This is the only case that can be definitely attributed to a disorganized personality that developed out of the conditions that produced the break down of a culture. His death may be attributed to the introduction of liquor among the Senecas. In turn, the frustrations that young partly educated Indians experience in trying to adjust themselves to a changing life are, I think, responsible for the excessive drinking among them.

Case 9.—Katherine K. who shot herself in revolt to parental discipline, 1932.[15]

Katherine K., a Seneca Indian girl of about 15 years, shot herself with a .45 caliber automatic pistol in 1932. Katherine was in the first year of high school, and her degree of Indian blood is uncertain, but her family is an old one on the Cattaraugus Reservation.

The cause seems to have been discontent with parental discipline. Her mother objected to Katherine's running around like other Indian girls of her age, who with the break down of the old maternal discipline run about at will. On the occasion of the tragedy the family had gone to a lacrosse game in Buffalo, and they had left Katherine home to take care of six small children. (Perhaps I should explain that the indoor lacrosse games at Broadway auditorium attract large audiences from the reservations to the city whither the Senecas flock to see their young men bruise one another and to visit with relatives and friends. The young people have a chance to meet each other and to escape in the slums of the city the scrutiny of their neighbors at home. The consequences are sometimes disastrous from the viewpoint of conscientious parents, of which there are still a few among the Indians.) Thus the parents had indulged themselves in a pleasure they denied their daughter. The next morning a neighbor discovered footprints in the snow leading to a lonely shanty where he discovered her body.

MISCELLANEOUS MODERN TYPES

Case 10.—A Tuscarora Maid of the Mists, *circa* 1890.

About 1890, a Tuscarora girl cast herself into the rapids above Niagara Falls because her parents refused to sanction her love affair. Clearly this type of suicide parallels the "Maid of the Mists" episode in Seneca folklore.[16]

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[15] Information on this case also was obtained from Miss Helen A. Wayne, Supervisor of Indian Welfare, New York State Department of Social Welfare, Buffalo.

[16] The Seneca girl, who has become impregnated by a snake, is so ashamed that she stands a canoe through the Niagara rapids above the Falls, but as she goes over the brink she is saved by Hinon, the thunderer, who lives in the cave of the Winds beneath the Falls. Later he delivers her of serpents, and finally she returns home. (*See* Hinon Saves a Woman from Suicide, in Curtin and Hewitt, 1918, pp. 228–229.) I have another version of the same tale from Cornplanter.

This Tuscarora girl was Ike Patterson's daughter, and she was probably 12 years old the last time I saw her when her father brought her to a Baptist convention here at Tonawanda. She would be nearly 60 were she living today [1935]. She promised to be a pretty girl. [Peter Doctor.]

It is difficult to tell her degree of Indian blood because the Tuscaroras have incorporated so many white prisoners during their wanderings and there have been so many intermarriages with white soldiers from Fort Niagara that none of them are full-blood Indians.

The girl grew up and met a white man at Niagara Falls, and she fell in love with him. The old Indian people, both her parents and her father in particular, resented the union and they broke it up. The girl decided that if she could not have the white man she would have no one. She went to Niagara Falls and waded into the rapids above the falls. [Peter Doctor.]

Case 11.—Dennison M.'s two unsuccessful threats.

Dennison M. is a Seneca male of 33 years (1935), nearly a full-blood (7/8), who lives when at home with his aged mother in the longhouse district of Tonawanda Reservation. He is the greatest wanderer of three vagrant brothers, and when at home he shares a workshop in the barn with his half brother Cephas. He spends long hours by himself carving, and fashioning archery tackle. Frequently, he destroys what he makes, feeling, perhaps with the true sense of an artist, that the creation is no longer to his liking. (I asked him why he destroyed his crafts, and he replied that he was sick of them.) He seldom goes out when at home, and I have never seen him with the other reservation youths at the dances and singing society meetings. Nevertheless, he is a famous dancer and showman, however reticent he may be about performing at home. On one of his excursions he bought a bicycle in Atlantic City and rode it all the way to Florida and the Gulf coast, making his living en route by staging a dancing and fancy-roping act on street corners. His misanthropic temperament emerges at home where, his brother says, he sometimes hides upstairs and refuses to come down when visitors call, in which situation they tell the visitor they do not know Dennison's whereabouts. At other times the family come down in the morning to find Dennison suddenly home from a trip, and a few days later he is off again before dawn without saying farewell. He is apt to turn up unexpectedly in distant places; in California to pose for some sculptor, at the Art Students League in New York, or at a cabaret in some other city, but all of his jobs end on pay day in a prolonged inebriation.

When Dennison gets drunk, according to Cephas, he frequently mentions killing himself. One night, when Cephas was fed up with his odd brother's repetition of this old theme of killing himself, he handed him a rifle, saying, "Why don't you do it and have it over with?" Dennison accepted the rifle and went outside. He has not mentioned suicide to Cephas since.

Another time he was arrested in Niagara Falls when he was drunk. One of the Park Police patrolmen saw him staggering in the direction of the Falls and set after him. Dennison walked away through the park toward the Falls. The officer told him to halt, and asked him where he was going, and Dennison replied that he was going to kill himself. Naturally, the patrolman, thinking the lad was about to jump over the falls, arrested him.

Case 12.—A mother and daughter who wanted to die, 1935.

This case should be considered in connection with case 4 because it involves the same maternal family. It would appear that there is almost a strain of potential suicide in this family. Abbie Brooks remarked to the nurse that she did not want to live—"I want to die; I do not want to get well"—when the nurse urged her to seek medical treatment for a large goiter, but, of course, since Abbie is hostile to white medicine, her reply may carry that bias. Last winter Abbie's daughter Lucy died of a number of complicated disorders resulting from an abortion and virulent tuberculosis. During the time when Lucy might have been removed to the hospital with fair chances for recovery, she consistently refused to go, saying that she did not want to get well. She felt that she had been deserted by her lover. The child was unwanted. Her parents took the typical Seneca attitude of refusing to assume the responsibility for sending her. They left it with their daughter. I secured this information from a trusted neighbor whom I sent in to talk with the girl about going to the hospital, and this explanation was currently given about the longhouse settlement. Her death temporarily cast a shadow over a number of suspects reputed to be the fathers of the unwanted child. Her case is no longer mentioned but it is not forgotten.[17]

EARLY CASES

Early travelers and missionaries to the Iroquoian Tribes recorded cases of suicide that fell under their observation which are markedly similar to the modern cases above. The early cases group themselves by method of commission into cases of suicide by taking poisonous roots (type A) and violent deaths by stabbing, shooting, and strangling (type B); and here too we find the love, revenge, and escape motives as operating causes. It appears then that here are the historical antecedents for the modern suicide patterns, and with this in mind, let us see how far back we can trace the methods and motives, proceeding upstream historically.

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[17] There have been recent cases of suicides following long illnesses. About 15 years ago, Jerry Pierce, of Irving on the Cattaraugus Reservation, following a long illness hanged himself (E. Pierce). My informant had a theory that hanging goes with melancholia and violent suicides with choleric temperament.

EARLY CASES OF ROOT POISONING: TYPE A

Speaking of *Cicuta* in his Medical Flora, Rafinesque (1828, vol. 1, p. 110) remarks of the Indians generally, though his observations were probably among the Delaware but may also include Iroquois, "The Indians when tired of life, are said to poison themselves with the roots of this plant [*Cicuta*] and the Purple Angelica, *Ax. atropurpurea.*"

Case 13.—Two murderers forego self-shooting, but one finally takes *Cicuta:* Senecas of Genessee valley, 1817.

Mary Jemison, the white woman of the Genesee, relates graphically how her quarrelsome son John, a prominent herbalist, following a premonition of death, was murdered in 1817 by Jack and Doctor, two Squawky Hill Indians, with whom he drank too freely. John had previously murdered his two brothers, and his violent passing made all the more deep his mother's loss. She relates that after several weeks of lying in the woods, Doctor and Jack, hoping to compound their crime, sent the customary wampum to Mary, but she returned it, advising them to leave the country lest they be killed [by her clansmen]. Roundly condemned by Tallchief, a spokesman for their own relatives, to wander the woods forever persecuted by their victim's ghost and their own delusions, forbidden entrée to the spirit-world, and knowing that if they returned home they would be at the mercy of their victim's relatives, they were abandoned to consult their own feelings as to whether they preferred prolonged exile or giving themselves up.

> As soon as they were alone, Jack said to Doctor, "I had rather die here, than leave my country and friends! Put the muzzle of your rifle into my mouth, and I will put the muzzle of mine into yours, and at a given signal we will discharge them, and rid ourselves at once of all the troubles under which we now labor, and satisfy the claims which justice holds against us."
>
> Doctor heard the proposition, and after a moment's pause, made the following reply:—"I am as sensible as you can be of the unhappy situation in which we have placed ourselves. We are bad Indians. We have forfeited our lives, and must expect in some way to atone for our crime: but, because we are bad and miserable, shall we make ourselves worse? If we were now innocent, and in a calm reflecting moment should kill ourselves, that act would make us bad, and deprive us of our share of the good hunting in the land where our fathers have gone! What would Little Beard [a Chief who died in 1806] say to us on our arrival at his cabin? He would say, 'Bad Indians! Cowards! You were afraid to wait until we wanted your help! Go (Jogo) [djagǫ′] to where snakes will lie in your path; where the panthers will starve you, by devouring the venison; and where you will be naked and suffer with the cold! Jogo, (go,) none but the brave and good Indians live here!' I cannot think of performing an act that will add to my wretchedness. It is hard enough for me to suffer here, and have good hunting hereafter—worse to lose the whole."
>
> Upon this, Jack withdrew his proposal. They went on about 2 miles, and then turned about and came home. Guilty and uneasy, they lurked about Squawky Hill near a fortnight, and then went to Cattaraugus, and were gone 6 weeks. When they came back, Jack's wife earnestly requested him to remove his family

> to Tonnewonta; but he remonstrated against her project, and utterly declined going. His wife and family, however, tired of the tumult by which they were surrounded, packed up their effects in spite of what he could say, and went off.
>
> Jack deliberated a short time upon the proper course for himself to pursue, and finally, rather than leave his old home, he ate a large quantity of muskrat root, and died in 10 or 12 hours.[18] His family being immediately notified of his death, returned to attend the burial, and is yet living at Squawky Hill.
>
> Nothing was ever done with Doctor, who continued to live quietly at Squawky Hill till sometime in the year 1819, when he died of Consumtion [sic].[19] [Mary Jemison.]

Cicuta was also in current use at Onondaga, according to Pursh the botanist, who visited Onondaga Castle in the summer of 1807 during his botanical excursion through New York. He observed the plant growing there, and it is evident that several suicides had occurred within the memory of his informant. On July 18, in company with Captain Webster, Pursh set out to learn the names of some herbs in Onondaga which Webster claimed to know and promised to impart to him.

Pursh observes,

> *Cicuta maculata* grows in great abundance throughout Onondaga: the Indians use it to poison themselves, when they have an inclination in going out of this world: it is a most powerful poison, as Capt. Webster tells me, who has seen the case on some Indians which had eaten the root, & was lost without being able to get anything as a remedy against it; it occasions Lockjaw & the patient is soon done. Elder bark or a Muskrat skin chopped fine, with the hair on is reckoned a remedy if soon applyed to.[20]

In several cases emetics seem to have been successful. Here there is a sympathetic association between the muskrat who likes the root and the use of its hide and hair in an emetic, as if to transfer the poison to the muskrat.

Mayapple poisonings.—The sources for the last three-quarters of the eighteenth century are disappointing where we expect them to be rich. Two able botanists, J. Bartram in 1743 and P. Kalm in 1748 and 1750, visited the Iroquois country, and neither mentions poisonous roots in use among the Indians (Bartram, 1895; Kalm, 1937); both neglect to mention the common mayapple, *Podophyllum peltatum* L., which grows widely from Virginia to Lake Ontario, and only Kalm recorded a variety of waterhemlock (*Cicuta ramis bulbiferus*) growing in the low-lying country west of Lake Champlain, but he does not connect the plant with the Indians. Curiously enough, however, the Moravian missionaries, Heckewelder and Zeisberger, cite some interesting mayapple suicides among the neighboring Delaware, but it is possible that these are Iroquois cases, for both men are writing general histories. Zeisberger traveled among the Onondaga, Cayuga, and Seneca Tribes, and there were Senecas living adjacent to the Moravian mission in Ohio where Heckewelder ministered following 1770. If these are Delaware cases, that tribe shared the Iroquois suicide complex, and they are pertinent to this paper.

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[18] When I read this account to Henry Redeye of Allegany, he said this is the plant they call o'nǫ''s‘ę'', which proved to be *Cicuta maculata* L. He also considered Seaver's inclusion of djageǫ, meaning "take courage!", a mistake; that go'gę'' was probably what Mary said.

[19] Seaver, 1932 edit., pp. 127–132; quotation, pp. 132–134.

[20] Pursh, 1869 (Beauchamp, ed., 1923, pp. 42–43).

Beauchamp notes (p. 66), . . . "the deadly *Cicuta maculata*, found then throughout Onondaga and still [1920] frequent on the Reservation. We yet hear of fatal results from chewing or eating the root. It is frequently mentioned in Seneca stories and distinguished as 'the root'." Beauchamp offers a list of Onondaga plant names from Albert Cusick (p. 75), "Muskrat Root or Water Hemlock.—*O-nah-san-a* [*o'ne'sä''na'*]."

> Wild citrons (*Podophyllum peltatum* L.) or May Apples, grow on a stalk not over a foot high. The Indians enjoy eating the fruit, which has a sour but pleasant taste. The roots are a powerful poison which, who eats, dies in a few hours' time unless promptly given an emetic. [Zeisberger, 1910, p. 47.]

Zeisberger continues later—

> In the use of poisonous roots the Indians are well versed, and there are many melancholy examples where they have by their use destroyed themselves or others. If a case of poisoning is taken in time, the effect of the poisonous root may be prevented by inducing vomiting. In case assistance is rendered too late, death follows, as a rule, in a few hours. There are poisonous roots that operate by slow degrees, in some cases illness may last a year or longer. [Zeisberger, 1910, p. 56.]

Case 14a.—There is a generalized case by Zeisberger, in connection with marital infidelity, and he probably refers to the same events as Heckewelder.

> Not every Indian, however, is indifferent to the light behavior of his wife. Many a one takes her unfaithfulness so to heart that in the height of his despair he swallows a poisonous root, which generally causes death in two hours, unless an antidote be administered in good time; this is often done, the Indians knowing that the properties of certain herbs counteract each other and being able to judge from the effects, what poison has been taken. Women, also, have been known to destroy themselves on account of a husband's unfaithfulness. [Zeisberger, 1910, p. 83.] [21]

It is evident from this account that more than one poison was in use and that the practice was not confined to either sex.

Heckewelder is a little more specific, and all of his cases are men who took *Podophyllum*.

> Suicide is not considered by the Indians either as an act of heroism or of cowardice, nor is it with them a subject of praise or blame. They view this desperate act as the consequence of mental derangement, and the person who destroys himself is to them an object of pity. Such cases do not frequently occur. Between the years 1771 and 1780, four Indians of my acquaintance took the root of the may-apple, which is commonly used on such occasions, in order to poison themselves, in which they all succeeded, except one. [See case 14b below.] Two of them were young men, who had been disappointed in love, the girls on whom they had fixed their choice, and to whom they were engaged, having changed their minds and married other lovers . . . The two others were married men.

Heckewelder goes on to cite the cases of the two married men.

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[21] The same account appears almost verbatim in Loskiel, 1794, p. 58.

One . . . was a person of excellent character, respected and esteemed by all who knew him. He had a wife of whom he was very fond and two children, and they lived very happily together . . . half a mile from . . . where I resided. He often came to visit me, and he was of a most amiable disposition, I was pleased with his visits, and always gave him a hearty welcome. When I thought he was too long about coming, I went . . . to . . . his dwelling. Here I always found the family cheerful, sociable, and happy, until some time before the fatal catastrophe happened, when I observed that my friend's countenance bore the marks of deep melancholy . . . His wife had received the visits of another man; he foresaw that he would soon be obliged to separate from her, and he shuddered when he thought that he must also part from his two . . . children; . . . for it is the custom . . . when a divorce takes place . . ., the children remain with their mother, until they are of proper age to chose for themselves. One hope . . . remained. The sugar-making season was at hand, and they were shortly to remove to their sugar-camp, where he flattered himself his wife would not be followed by the disturber . . ., whose residence was about ten miles from thence. But this hope was of short duration. They had hardly been a fortnight in their new habitation, when, as he returned . . . from a morning's hunt, he found the unwelcome visitor . . ., in close conversation with his faithless wife. This . . . was more than he could bear; without saying a . . . word, he took . . . a large cake of his sugar, and . . . came to my house, . . . eight miles from his temporary residence. It was . . . a Sunday, . . . [10 a. m.], that he entered . . . with sorrow strongly . . . on his . . . countenance. As he came in he presented me with his cake of sugar, saying, "My friend! you have many a time served me with a good pipe of tobacco, and I have not yet done anything to please you. Take this as a reward for your goodness, . . . from me as your friend." He said no more, but giving me with both his hands a warm farewell squeeze, he . . . returned to the camp. At about two o'clock in the afternoon, a runner from thence passing through the town to notify his death to the village two miles farther, informed us of the shocking event. He had immediately on his return, remained a short time in the house, indulging in the last caress to his . . . children; then retiring to some distance, had eaten the fatal root, and before relief could be administered by some persons who had observed him staggering from the other side of the river, he was on the point of expiring, and all succours were vain. [Heckewelder, 1819, pp. 258–259.]

14b.—Heckewelder's second case is also that of a married man, but he had no children. He lived happily with his wife, until one day that she fell into a passion and made use to him of such abusive language as he could not endure. Too highminded to quarrel with a woman, he resolved to punish her by putting an end to his existence. Fortunately, he was seen in the first stages of his fits, and was brought into a house, where a strong emetic diluted in luke-warm water, . . . was forcibly poured down his throat. ([He] . . . had poisoned himself with the root of the May Apple (*Podophyllum peltatum*). It [the emetic] consisted of a piece of raccoon skin burned with the hair on and finely powdered, pounded dry beans and gunpowder. These three ingredients were mixed with water and poured down the patient's throat. This brought on a severe vomiting, the poisonous root was entirely discharged and the man cured.[22] [Heckewelder, 1819, pp. 225–226.] He recovered after some time, but never was again the strong healthy man he had been before; his wife, however, took warning from this desperate act, and behaved better. [Ibid., p. 260.]

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[22] It is interesting to note that Abbie Gordon said they gave an emetic of boiled beans to her uncle Elijah Brooks, case 4, when he took *Cicuta*. Pursh describes a similar emetic among the Onondaga.

Case 15.—An Iroquois woman eats mayapple root to follow her deceased husband: Onondagas (?) at Fort Frontenac, 1684.

The Iroquois also did not entirely rely upon the poisonous waterhemlock. Zeisberger's remarks suggest that the Delaware used other roots besides mayapple, and for a time the Iroquois, according to Lahontan and others, were using mayapple. This especially baffles me because Seneca informants, save one, scout the idea that mayapple is poisonous. They regularly stew the roots for a physic, and all the data which Waugh and I have collected point to waterhemlock as the suicide root. Nevertheless, regardless of failing tradition, Lahontan describes a plant like mayapple, without giving its Onondaga or Huron name, and the Baron was markedly impressed by the constancy of the Iroquois woman who took this root to follow her decreased husband.

> The Citrons of North-*America* are so call'd, only because their form resembles that of our Citron, Instead of a Rind, they have only a single skin. They grow upon a Plant that rises three Foot high, and do's not bear more than three or four at a time. This Fruit is as wholsom [sic] as its Root is dangerous; for the one is very Healthy, and the juice of the other is a mortal subtile Poyson. While I stay'd at Fort *Frontenac*, in the year 1684, I saw an *Iroquese* Woman take down this fatal Potion, with a design to follow her deceased Husband; after she had took leaves of her Friends, and sung the Death Song, with the formalities that are usual among these blind Wretches.[23] The Poison quickly worked the desir'd effect; for this widdow, who in *Europe* would be justly look'd upon as a model of Constancy and Fidelity, had no sooner swallowed the murdering Juice, than she fell into two or three shivering Fits, and so expir'd. [Lahontan, 1703, vol. 1, pp. 250–251.]

Lahontan gives us the impression that among the Hurons (?) it was the regular sequence for spouse to follow spouse by suicide within a few months after the death of the first, and particularly when the survivor had dreamed more than once of the deceased mate. It is against just such contingencies that the society of Chanters for the Dead (hono'hgi˙we˙) attempt to placate the restless soul, and free the mind of the survivor.

> When the Husband of a Wife comes to dye, the Widowhood does not last above six Months; and if in that space of time the Widow or Widower dreams of their deceas'd Bedfellow, they Poyson themselves in cold Blood with all the contentment imaginable; and at the same time sing a sort of tune that one may safely say proceeds from the Heart. But if the surviving Party dreams but once of the Deceased, they say, that the Spirit of Dreams was not sure that the dead Person was uneasie [sic] in the Country of Souls, for asmuch as he only pass'd by without returning, and for that reason they think that they are not oblig'd to go keep him Company. [Lahontan, 1703, vol. 2, pp. 41–42.]

CICUTA POISONINGS, 1720–1672

Cicuta was taken as well during this same period, which Lahontan describes, but, unfortunately, none of the relations say that both waterhemlock and mayapple were in use at the same time, or they give a native term without describing the plant, or the reverse, or neither. We can compare their accounts and attempt to equate the native terms with modern survivals in the same or related languages, which has profited little, because of linguistic drift or change of terminology.

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[23] The Personal chant (ádq˙.wę') was sung to return thanks in religious festivals, to boast at war feasts and during torture, and as a finale at death.

The accounts of specific *Cicuta* poisonings go back to 1672 for the Onondagas, and presumably the other Iroquois, and likely some of the earlier ambiguous accounts are of suicides by this root. The motives continue to be chagrin and revenge over reprimands or mistreatment.

Case 16.—A spiteful girl takes *Cicuta:* Lafitau, Iroquois, 1710–20.

Lafitau, of whom Parkman (1885, p. LIV) has said, "None of the old writers are so satisfactory," paints the Iroquois, to whom he ministered for a decade following 1710, as a thin-skinned lot, who as children had been left to develop bad habits on the pretext that they had not yet attained the age of reason, whose most serious punishment was to have water thrown in the face, and who were never struck. And among them it was not extraordinary to see them poison themselves with *Cicuta* over a moderately severe scolding, and thereby make away with themselves.

> Les sauvages en general sont d'ailleurs si sensibles, que pour un reproche un peu trop amer, il n'est pas extraordinaire de les voir s'empoisonner avec la ciguë, & se défaire eux-mêmes. [Lafitau, 1724, vol. 1, p. 603.]

In another place, when writing of the unequal status of souls in the hereafter according to their manner of death, he cites a specific case which occurred in the experience of a brother missionary. He speaks of a young Iroquois(?) girl who wept bitterly over her sister, who was dying from a quantity of *Cicuta* which she had taken in a huff and to ensure her death refused any antidote, because neither bonds of blood or friendship could touch her, and because she knew that her sister's suicide would eternally separate them in the land of souls.

> Ce païs des Ames a aussi ses differens étages, & tous n'y sont pas également bien. C'est ce que conclut un de nos Missionaires, de ce qu'il entendit dire à jeune Sauvagesse. Cette fille voyant sa soeur mourante, par la quantité de ciguë [*Cicuta*] qu'elle avoit prise dans un dépit, & déterminée à ne faire aucun remede pour se guarantir de la mort, pleuroit à chaudes larmes, & s'eforçoit de la toucher par liens du sang, & de l'amitié qui les unissoit ensemble. Elle lui disoit sans cesse: c'en est donc fait, tu veux que nous ne nous retrouvions jamais plus, & que nous ne nous revoyions jamais ? Le Missionaire frappé de ces paroles, lui en demanda la raison. Il me semble, dit-il, que vous avez un païs des Ames, où vous devez tous vous réünir à vos Ancêtres; pourquoi donc et-ce que tu parles ainsi à ta soeur ? Il est vrai, reprit-elle, que nous allons tous au païs des Ames; mes les méchans, & ceux en particulier, qui se sont détruits eux-mêmes par une mort violente, y portant la peine de leur crime; ils y sont separés des autres, &

n'ont point de communication avec eux: c'est-là le sujet de mes peines. [Lafitau, vol. 1, p. 404.]

Case 17.—Girls scolded by mothers eat *Cicuta*: Onondaga, *circa* 1690.

Bacqueville de la Potherie, whose visit to the Iroquois, 1689–1701, preceded Lafitau's, describes the same methods of rearing children, and the danger that scolding might produce child suicides. Onondaga daughters who have been scolded by their mothers eat *Cicuta* to poison themselves, while youths kill themselves with gun or knife.

> Les Filles d'Onnontaquez qui ont été reprises par leurs Meres, mangent de la Ciguë pour s'empoisonner, les enfans se tuënt avec leur fusil ou avec leur coûteau. [La Potherie, 1753, vol. 3, p. 16.]

Case 18.—Annoyed young woman takes poison: Seneca, 1672.

A generation earlier, the Jesuit Raffeix reported an isolated case from the Seneca mission.

"A young woman had poisoned herself, in consequence of serious annoyance that she had experienced."[24] The context conveys the impression that she was annoyed by unwelcome male agressors.

Case 19.—Abandoned wife takes hemlock juice: Onondaga, 1672.

About the same year Lamberville writes in the Relation of 1672–73 of an Onondaga woman who took hemlock juice (waterhemlock) over the loss of her husband to a rival. Neither Lamberville's emetic brings up the poison, nor his persuasions convince her that she has sinned, and she dies asserting that the guilt is on her faithless husband.

> Another took some Hemlock juice, because she could not bear to see herself abandoned by her husband, who married her rival. I am summoned in the capacity of a physician who has already succeeded in counteracting the effects of that poison. I make her take orvietan [a popular antidote of the period], and shortly afterward some theriac,—on condition that no one else shall give Her any other medicine, lest it should take away the strength of mine. But hardly have I left the Dwelling than a woman makes Her swallow more than a pint of Colored water. I ask the attendant whether she thought that it was good medicine; she says that she knew nothing about it, but that, as she had been requested to give a medicine, she prepared one as she was able . . . [The Iroquois have not forsaken this ancient duplicity in medicine, and no modern practicioner on the reservations knows at what point his perscriptions may be upset by an overdose of herbal medicine.] . . . I give an emetic . . . The poison has already penetrated into the intestines. [Here a shaman intervened and the Father made the mother understand that her daughter had sinned, which she agreed.] Meanwhile, the sick woman is frothing at the mouth; she utters loud cries and is seized with dreadful convulsions. . . . "I have not sinned," she says, "he who has abandoned me is The one who is Guilty."[25] [Lamberville *in* Thwaites, 1896–1901, vol. 57, pp. 165–169.]

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[24] Dablon, 1672–74 (Thwaites, 1896–1901, vol. 58, p. 239).

[25] William Penn mentions a similar case among the Delaware without naming the herb. He writes in a letter dated 1683, that they (the Delaware) are great concealers of resentment, how "a King's [Chief's] daughter thinking herself slighted by her husband in suffering another woman to lie down between them, rose up, went out, plucked a root out of the ground, and ate it, upon which she immediately died;" her husband later made an offering to her relatives for atonement and liberty to marry again (Penn, 1683, p. 210).

Case 20.—More suicides of children and married women: Iroquois, 1656.

From the Relation of 1656–57, we have the earliest cases from the Iroquois proper, perhaps the source for Lafitau's interest in the sensitiveness of children, their horror of restraint, their predilection for revenge, and suicides by eating poisonous plants, of which he specifies *Cicuta*. Dablon writes of the Iroquois, while referring to the Onondaga nation whom he knew best,

> There is nothing for which these people have a greater horror than restraint. The very children cannot endure it, and live as they please in the houses of their parents, without fear of reprimand or of chastisement. Not that they are not punished sometimes by having their lips and their tongues rubbed with a very bitter root [probably one of the Hellebores]; but this is seldom done for fear that vexation might lead the children to cause their own death by eating certain noxious plants, which they know to be poisonous. These are most often used by the married women, to revenge themselves of the ill treatment of their husbands by thus leaving them the reproach of their death. [Dablon *in* Thwaites, 1896–1901, vol. 43, p. 271.]

HURON CASES OF POISONING, PRIOR TO 1650

Prior to 1650, the Relations concern the missions to the Hurons among whom there are several parallel cases of suicides by eating poisonous roots. These cases may be the prototypes of the suicide patterns we have been discussing, which were probably also current among the Iroquois of the period. However, there is the possibility that the Hurons may have introduced the custom among the Senecas who incorporated part of them following 1648. Naturally the plant identifications are confused or lacking in this early period because the observers were confronted with the double problem of learning an Indian language and a New World flora.

Case 21.—Youth mysteriously poisons himself: Hurons, 1640.

Neither Chaumonot nor Lalement was able to discover the reason why a young Huron poisoned himself, as they say, with aconite, and it is equally baffling why he chose their cabin as his death spot unless he hoped that he might gain some special advantage in the hereafter through the magic of salvation. The poison is probably not aconite, which was introduced and naturalized in the northeast somewhat later;[26] and there is no record for native species as far north as Ontario (Gray, 1908, p. 407). Furthermore, the symptoms more nearly resemble those attending *Cicuta* poisoning (Muenscher, 1939, p. 173).

> Some days ago [March 21, 1640], a young man from Saint François Xavier [west side of the Wye River, near Wyebridge, Ontario] entered our cabin early in the morning; he came with a firm step, and singing like those who go to war

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[26] Aconite (*Aconitum napellus L.*) was introduced from Europe to the northeast (Muenscher, 1939, pp. 77–79). "None of this genus is weedy in Eastern North America" (Pammel, 1910–11, pt. 2, p. 449).

> [Personal Chant (a′dǫ· wɛ̨′)].[27] . . . he was already tormented by the violence of the posion when he entered our cabin.[28] Hardly is he seated when his heart fails him [Aconite and Hellebore act on the heart]; he falls to the gound and cannot rise again. We suppose that he is either acting the lunatic, or that he is one; we try to put him out; he gently begs us to wait [Lalement]. Having there succumbed, he flings himself to the ground, foaming, with all the signs of approaching death [Chaumonot]. His eyes roll in his head, the foam comes to his mouth; we know not what these symptoms mean. We ask him his name, where he is from and who are his relatives, that one may go and fetch them: to that he answers, but "Alas!" he added, "I shall be dead before they come; only give them that," he said, drawing from his tobacco pouch a piece of root [Lalement]. Being questioned . . . his only answer was to present the remainder of the root that he had eaten,—bidding to show it to his parents after his death . . . [Chaumonot]. We are ignorant of his meaning: nevertheless, one of our Fathers leaves in haste to go and fetch his relatives; hardly had he crossed half the width of the lake, on which the ice was still quite firm, when he met here and there some Savages who were fishing. He said to one who was nearest, that such a young man from the next village was very sick in our house, and at the same time hands him the piece of root. This man puts it to his lips [a common Iroquois method of identifying roots], and without making other answer to the Father, exclaims to his comrads: "Such a one is dead,—he has eaten aconite [sic]; let us go and get his body." They leave their fishing there, they run in haste; but . . . Father . . . tries to anticipate them, . . . [to] baptize . . . [the] man . . . [if] possible, . . . he had eaten posion . . . the sickman had told us that poison was causing his death; . . . We were completing the act of his salvation, when these barbarians arrived in a crowd, and put him on a hurdle [toboggan ?] to draw him over the ice of the lake, and convey him to his house; but alas ! he soon began to vomit blood, and suddenly died by the way. It all lasted not an hour. This happened on the 21st of March [1640], day of St. Benoist. [Lalement.]

Lalement questions whether they could have hit upon a more suitable name. One wonders whether his coming to their house was a protest against Christianity, or whether he believed that baptism might gain him some special advantage in the land of souls.

There remain three earlier cases of root poisonings among the Hurons. LeMercier, writing in LeJeune's Relation of 1637,[29] reports that two young men in 1637 (case 22) and 1636 (case 23) poisoned themselves by eating a root, spelled variously Ondachienroa (1636) and Andachienrra (1637); and Brébeuf refers to a poisoning in 1635, the earliest recorded case of suicide in the Relations,[30] without specifying the plant.

Case 22.—Young man poisons himself at Ossassané: Huron, April 15, 1637.

> On the 15th, we learned that a young man had poisoned himself at *Ossassané;* and in reference to this some Savages told us that one of the principal reasons why they showed so much indulgence towards their children, was that when the children saw themselves treated by their parents with some severity, they usually resorted to extreme measures and hanged themselves, or ate of a certain root that they call *Andachienrra,* which is a very quick poison. [LeMercier, 1637.]

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[27] Lalement, 1640 (Thwaites, 1896–1901, vol. 19, pp. 171–175).

[28] Chaumonot to . . . P. Nappi, 1640 (Thwaites, 1896–1901, vol. 18, pp. 27–29).

[29] LeMercier, 1637 (Thwaites, 1896–1901, vol. 14, p. 37 and vol. 13, p. 27).

[30] Brébeuf, 1635 (Thwaites, 1896–1901, vol. 8, p. 121).

Case 23.—Chiefling sends daughter after the root: Hurons of Ihonatiria, 1636.

Writing in the same Relation (LeJeune's Relation of 1637), LeMercier describes the death of Saronhes, Louis de Sainte-Foi, the principal native convert of the Huron town Ihonatiria, who had been markedly unfaithful to them by gambling on an island near Kebec.

> We did not see anything of him, and the first news we heard was that he was sick, and almost at the same time we learned of his death . . . some persons told us that he had not died a natural death, but the grief that he had felt for the loss of his son had so plunged him into despair that he himself had shortened his days. This is the way they say it occurred: One day, when he found himself alone in his cabin with one of his little daughters, he sent her to get a certain root that they call *Ondachienroa*, which is a quick poison. This child went for it very innocently, supposing that her father wanted to make some medicine, as he had shown some slight indisposition. She brought him some, but not enough to suit him, and she returned for it the second time. He ate his fill of it; a high fever attacked him, and carried him off in a little while. But his relatives do not admit that he died in this way. [LeMercier, *in* Thwaites, 1896–1901, vol. 13, p. 27.]

It is apparent that the good Father was a bit piqued because of the unchristian manner of his death.

Case 24.—Wife taken away (death?), young man poisons himself: Hurons, 1635.

Brébeuf implies that there was no distinction made in the hereafter between the souls of suicides and the ordinary dead, and cites the evidence that no distinction is made at burial, and that no punishment awaits the wicked in the hereafter. Referring to their myths, he says,

> . . . they make no mention either of punishment or reward, in the place to which the souls go after death. And so they do not make any distinction between the good and the bad, the virtuous and the vicious; and they honor equally the interment of both, *even as we have seen in the case of a young man who had poisoned himself from the grief he felt because his wife had been taken away from him.* [31]

THE IDENTITY OF THE POISON

It is my conviction, after an analysis of the sources and the linguistic terms, that the suicide root referred to in these cases is waterhemlock, *Cicuta maculata* L., rather than mayapple, *Podophyllum peltatum* L. Let us first consider the evidence from the sources. Heretofore, the root has been accepted as mayapple on the following grounds. In case 23 to which LeMercier was not an eyewitness, there is the implication that the root might have been brewed into a medicine which was taken internally. Mayapple is a powerful physic, as we shall see; but this evidence has not been presented by others. Thwaites, the editor of the Jesuit Relations

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[31] Brébeuf in LeJeune's Relation, 1635 (Thwaites, 1896–1901, vol. 8, p. 121). Italics mine.

(1896–1901, vol. 13, p. 270), in a note on LeMercier's account of 1636 (case 23), connects Ondachienroa with mayapple on the basis of Sagard's Voyage to the Hurons (p. 268), and Laverdière's footnote to Champlain's clear description of mayapple in 1615.[32] Laverdière (and Biggar) cites Brunet, the Quebec botanist of the nineteenth century, as authority for saying,

> The fruit of this plant (*Podophyllum peltatum* L.) which one calls "citronier," in the country, is good to eat; but the root is a violent poison which the savages made use of sometimes when they could not outlive their sorrow. [Trans.][33]

However, Champlain does not give the Huron name of the plant, and he does not connect it with suicide. Sagard (1865, vol. 1, p. 187) writes of Indian medicine and health in his Voyage (written, 1632) and in his Histoire written in 1636 (1866, vol. 3, pp. 603–607), referring to several roots. The first, Oscar, has properties of bloodroot or sassafras, but phonetically, *oska· resembles Seneca, ʼoska′·ʼa, or hellebore, *Veratrum viride* Ait. The third, which he calls Ooxrat, *o·ksra′, has all the smarting properties of, and probably is, the hellebore, and his comparison of the root to a "peeled chestnut" (*chastaigne pellée*), or a "cabbage stalk" (*naveau*), fits the dried root of hellebore, which is still popular among the Iroquois as a snuff for catarrh. Wrong (1939, p. 195) suggests sarsaparilla, *Aralia nudicaulis*, for Oscar, and Indian turnip, *Arisaema triphyllum*, for Ooxrat, but he agrees with me that ondachiera is waterhemlock, *Cicuta maculata* L. This is Sagard's second plant which he warns is very poisonous, and he warns that on no account should one eat any root which one does not know. He tells of the fright they experienced one day over a young Frenchman who had pulled it up in the woods. [Mayapple does grow in the shaded woods about villages.] He became seriously ill, and he was fortunately cured by an emetic composed of some tree bark that a Huron gave him. But Sagard does not describe the citron-like fruit of mayapple, nor does he say this root was used for suicides. A letter dated 1709, which C. M. Barbeau kindly excerpted for me from the Archives of the Seminary of Quebec (Archives du seminaire de Quebec, Fonds Casgrain. "Lettres sur l'Amérique septentrionale" ou "Relations/ Par Lettres de/ l'Amérique septentrionale," Premiere lettre datée de 1709) reads, "Les hurons . . . s'empoisonment avec racine de Cigüe ou de citronnier. . . . [The Hurons . . . poison themselves with the root of waterhemlock or of mayapple. . . .]. The sources, then, give both mayapple and waterhemlock.

The linguistic evidence favors waterhemlock. The modern Huron-Wyandot term for mayapple, uja′·rawiʼ, "fruit in between," or "sour fruit on" (Barbeau), bears no resemblance to Ondachiera; uja′·rawiʼ

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[32] Champlain, 1615 (Laverdière ed., 1870, vol. 4, p. 31; and Biggar ed., 1929, vol. 3, pp, 50–51).

[33] Cited by Laverdière, 1870, vol. 4, p. 31, from l'Abbé O. Brunet, Catalogue des Plantes Canadiènnes dans l'herbier de l'Univ. Laval, livr. 1, p. 15, Quebec, 1865. This catalog is not available in the library of the U. S. Dept. of Agriculture or the Library of Congress.

is rather related to Seneca, o·gwa'·'a, "round fruit on it" [hence, modern "orange"], Cayuga, o'gwa'·'; Onondaga, u‘gwa'ä', "berries on" (Waugh); and the other modern term, "shade maker" [hence, modern "umbrella"] is also unrelated to ondachiera: Seneca, ade'ǫnoshɛ', "it makes shade," Cayuga, ų'tnǫsada'hkwa'; modern Onondaga, ona'hutsde' (Waugh), and Onondaga of 1650-1710, onehαensta (*onα'hwensta'), "citron" (Shea, 1860, p. 33); Mohawk, onųhųste'u‘dera (Waugh), but even this last form hardly suggests ondachiera. All of these tribes know the cathartic property of the root, and prepare from it a physic by boiling, or roasting and then boiling, which likely reduces the percentage of podophyllin. Elijah David, a Tonawanda Seneca, advised Waugh to cut out the portion of the root where the rootlets branch as this contains the poison, and to use the rest of the root taken in spring before the plant flowers (Waugh, 1912, vol. 7, pp. 44–55). Some Senecas fear and dislike the plant (Fenton), other informants warn against overdoses of the powerful physic (Waugh and Fenton), and one foolhardy Cayuga recommended eating the roots raw (Waugh); and it is certain the mayapple has not been fashionable in recent suicide cases.

Huron, Ondachiera (Sagard, 1632), Ondachienroa, Andachienrra (LeMercier, 1637), rather resemble the modern terms for *Cicuta* in the various dialects: Mohawk, *ONASĄ·RA from Caughnawaga, o'nahseṛ, or o'nä'sä̜ṛ (Waugh), and St. Regis-Mohawk, onahsǫ'·ṛa, "feather-white" (Fenton); Onondaga of New York, o'ne'sä̜'·na', Onondagas of Six Nations, Ontario, onashę''ę·' (Fenton); and Tuscarora, o'-nă-sĕñ'-ä' (Hewitt) are derived from the old Onondaga, honachinra [*ONAŠĘ'·RA'], *cigüe*, *Cicuta maculata* L. (French-Onondaga dictionary, Shea, 1860, p. 33). However, Cayuga, u'na‘sä̜ä̜' (Waugh), onashę'·' (Fenton) and modern Seneca, o'nǫ''shę·'ę or o'nǫ'hshę'ę, "odorous fleshy tuber," or "looks like onion" (Fenton), are more differentiated from the other dialects. The close resemblance between the seventeenth-century spelling of the Onondaga term, honachinra, for *Cicuta*, and the spelling of the Huron word, ondachiera, taken together with the modern Mohawk, onasα'·ṛa, clinches the matter because the resemblance is also clear between the seventeenth-century term, *onáhwensta', and the modern Onondaga term, onáhutsde', for mayapple. In the same way that Onondaga *ONAŠĘ·RA' has become o·ne'sä̜'·na', we would expect early Huron *ONDAŠIĘ·RA', made up of *ONDAS- (or *ONAS-) meaning "plume" or "feather," plus *-SĘRA', meaning "whitish," as in the Mohawk, to become *O NA ṢĘ·RA' in modern Huron. This will have to await verification among the Wyandots of Oklahoma because the Hurons of Lorette, P. Q., no longer speak their language.

VIOLENT SUICIDES BY STABBING, SHOOTING, AND STRANGLING: TYPE B

From the seventeenth century also there are a series of suicides that resemble the type B modern cases where the escape motive in violent death predominates. Stabbing, shooting, and strangling appear to be as old as poisoning with the Iroquois, who resorted to the former methods under duress of torture and imprisonment pending certain torture, and less frequently under the unhurried circumstances of love affairs and chagrin following gambling losses, which usually led to poisoning.

Case 25.—One Iroquois prisoner stabs himself to avoid torture, but his companion braves the fire: Quebec, 1692.

Following a year of severe raids on the French settlements in the St. Lawrence valley, Governor Frontenac ordered burned two prisoners of the Five Nations, who had been taken early in the year when their party was defeated beyond Montreal; he hoped that their torture would serve as an example to ward off future Iroquois raiders on Quebec towns. Frontenac refused the pleas of his lady and the Jesuits who hastened to prepare the prisoners for death with Baptism. However, the haughty Iroquois dismissed the good Fathers, and prepared in their own way by singing the Death Song.[34] The one who stabs himself to escape certain torture is roundly condemned by his comrade as a "Coward, a Scandal to the Five Nations" (Colden) while he fulfills the role of the brave Iroquois warrior and faces death by torture unflinchingly.

> Some charitable Person having thrown a Knife to them in Prison, he who had the least Courage of the two, thrust it into his Breast, and died of the Wound immediately. Some young *Hurons* of *Lorette*, aged between fourteen and fifteen years, came to seize the other, and carry him away to the *Diamant Cape*, where notice was given to prepare a great pile of Wood. He ran to Death with a greater unconcernedness, than *Socrates* would have done, if he had been in his case. During the time of Execution he sung continually; "That he was a Warriour, brave and undaunted; that the most cruel kind of Death could not shock his Courage, that no Torments could extort from him any Cries, that his Companion was a Coward for having killed himself through the fear of Torment; and lastly, that if he was burnt, he had this Comfort, that he had treated many *French* and *Hurons* after the same manner." [Lahontan, 1703, vol. 1, p. 178.]

Case 26.—Unsuccessful attempts of Miami captive to swallow stones and hang himself: Onondaga, 1682.

This case is of interest only because it occurred at Onondaga and it illustrates the way traits spread from the Central Algonkians to the Iroquois. Here we have a Miami captive bound for certain torture at Onondaga who twice attempted to swallow stones during the journey, and thereby rob his captors of the honor of bringing him in alive, a device which might readily occur to some Onondaga in future similar circumstances.

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[34] Lahontan, letter dated Oct. 25, 1692 (1703 vol. 1, pp. 177-179.) It appears that Colden (1902, vol. 1, p. 171) copied Lahontan.

> When the warriors perceived [his fright on approaching Onondaga village], fearing that the apprehension of death might lead him to swallow some stones,—as He had already twice done,—in order to kill himself, and that they would not have the honor of bringing him in alive, They promptly made him march in their midst, always singing his Doleful air, his face being painted red.[35]

That same night, seated high in an Onondaga house, he attempted to draw himself down on the rope that bound him by the neck to a house post, but the rope broke.

Case 27.—Two mistreated old men: Onondaga, 1682.

Two old men were potential suicides this same year at Onondaga, Lamberville reports, because they were mistreated by their cabin mates. One old chief mourned the loss of his wife, and the other had served too long as a butt for the village drunkards. The first hanged himself, and the other was found dead.

Case 27a.—An old man hangs himself to join his deceased spouse.

> An old Captain who still retained his rank among the leading men of the Village . . . God had, 2 years before taken away . . . his wife; Father Bruyas . . . had baptized her. [Persecuted by slaves of other nations adopted in place of deceased sisters who lived in the same cabin] He took the resolution to rejoin her as soon as possible; He frequently went to visit her grave, two leagues from here [at the site of the old village]. Two years . . . [he considered] causing his own death, that he might the sooner go to heaven to see his own wife again. He had a swollen Cheek, which they persuaded him was the effect of the pretended sorceries of certain half sorcerers or jugglers of the country. [Some Iroquois still believe that sorcerers can project disease objects into the body causing inflamed swellings.] This, Added to the bad treatment that the women of his cabin made him endure, induced him to put an end to his troubles by death. He asked me, on one occasion, whether Christians who were tired of life were not permitted to strangle themselves, so that they might the sooner go to the land of the blessed souls. [This may have been an Onondaga tabu against spouse suicides which he hoped to escape in the new Christianity.] I [attempted to turn] him from so detestable a purpose, but He always thought that he could abandon life, which he looked upon as something of which He could dispose; and on the very next night He hanged himself, at the same Spot where he usually slept. The women who had been the cause of his vexation were Awakened by some noise that he made, and Immediately hastened to the miserable man; but it was too late, for, after they had untied the rope, He expired in Their hands. The Whole village was horrified at this act. [Lamberville *in* Thwaites, 1896–1901, vol. 62, pp. 61–65.]

Case 27b.—Another old man found dead.

> A poor blind Old man, nearly a hundred years old, who had formerly been baptized by Father Bruyas, . . . repelled by his relatives, and continually exposed to the fury of the drunkards,— Weary of his misery, and knowing not where to take refuge . . . or procure food, was found dead. There are various opinions regarding him. [It was not clear whether his case was a suicide.] [Lamberville *in* Thwaites, 1896–1901, vol. 63, p. 65.]

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[35] Lamberville, letter dated August 25, 1682 (Thwaites, 1896–1901, vol. 62, pp. 85–87, 91).

Case 28.—Convert remembers Jesuit teaching and throws away knife: Huron, 1659.

Lalement tells of a third Huron who had miraculously escaped the flames at Onondaga. A friendly Huron, who had been previously adopted there, slipped a knife to his tribesman on the way to the village. Lalement takes particular delight in reporting this unusual case of fidelity to his teachings on the part of his pupil who prayed during the torture instead of singing the customary Death Song.[36]

> At sight of Onondaga . . . I resolved to cut my throat in order to escape by a sudden death—and one, that was very gentle, in my opinion—the thousand deaths that I had before my eyes. I had the knife in my hand, and was already to deal the blow, when I recalled what the Fathers had told me in times past—that we are not the masters of our lives, that it is for God alone to lengthen or curtail our days, and that I could not employ this violence without committing a great sin. After this thought, which from the first made me waver a little in my resolve, I offered myself to god, . . . to free myself from temptation, which was a very strong one, I cast my knife far away from me, and bravely took up my march toward all the people awaiting me. [Lalement *in* Thwaites, 1896–1901, vol. 46, p. 41.]

Case 29.—Onondaga hostage cuts his throat when Mohawks overtake and massacre a Huron peace delegation: Huron country, 1648.

Paul Raguenau writes from the Huron country in 1648 that an Onondaga ambassador, who had remained a hostage in the Huron village, killed himself when the Hurons learned that a party of Mohawks overtook and killed the Huron ambassadors returning from a good will mission to Onondaga. Hewitt (1928, p. 457) holds that this individual held the title of Skanawati, fire keeper of the federal council.

> At the beginning of the month of April, Scandaouati, the Onnontaeronnon Ambassador who had remained here as a hostage, disappeared, and our Hurons thought he had escaped; but after some days his Corpse was found in the middle of the wood, not far from the Village where he had resided. The poor man had killed himself by cutting his throat with a knife, after having prepared a sort of bed of fir-branches, on which he was found stretched out. [Raguenau *in* Thwaites, 1896–1901, vol. 33, p. 125.]

It is difficult to decide whether his motive was shame of the great dishonor the Mohawk allies had done the League, or fear of the almost certain revenge torture which his Huron bonders would seek, or whether the motive was vanity, as Wisse (1933, p. 172) suggests.

Case 30.—Onondaga captive dives into Huron kettle to avoid torture: Huron country, 1647.

Early the previous year (1647), the Hurons had repulsed the Onondaga invaders, who were not always individually capable of taking the tortures which they sadistically practised on their enemies. The Hurons overtook and defeated an invading Onondaga war party, killing the leader and taking prisoners who, excepting Annenraes, they burned.

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[36] Lalement, Relation of 1659–60 (Thwaites, 1896–1901, vol. 46, pp. 37–39).

> . . . one of those who was destined to the flames, seized with a horror of the cruelties that awaited him cast himself headlong into a great kettle of boiling water, to shorten his tortures with his life. [Raguenau, 1648 (Thwaites, 1896-1901, vol. 33; p. 117).]

Unless Raguenau refers to a trade kettle, the feat gives us a gage of the enormity of this Huron cooking pot.

Case 31.—Three Algonkin women escape Iroquois torture and kill themselves, 1647–42.

These cases are taken together because they occurred under similar conditions to three women taken from the Algonkin Tribe to Onondaga for torture or adoption; they stand in marked contrast to to the usual Iroquois women's suicides by poisoning.

a. The first woman failed twice to hang herself, and finally made her way to Quebec where she describes her awful experience (1646) to Father Lalement. She escaped from torture in an [Onondaga] Iroquois village and fled to the woods. Hiding daily at the wood's edge in constant fear of apprehension, she soon despaired of stealing enough corn for a 2 months' journey to Quebec, and decided to kill herself rather than be tortured.

> Having said her prayer, she fastens her belt to a tree, up which she climbs; she makes at the other end a running knot, which she slips about her neck, and throws herself down. The weight of her body broke the cord without doing her great injury; she mends it, tries it, and then climbs up again; but God willed that it should break for the second time. She, much astonished, begins to say . . . perhaps God does not wish me to die.[37]

b. Another woman, more hostile to the faith, succeeded; although advised by other women of the band not to carry out her evil intention,

> . . . she heeded not this counsel. Laying hands on her child, she murdered it, and threw it at the feet of the Hiroquois; then, having slipped her head into a halter, she pulled with one hand to strangle herself, and with the other she cut her throat with a knife. [Lalement *in* Thwaites, 1896–1901, vol 30, pp. 275–277.]

c. A third Algonkin mother tried to drown herself after her child was burned. She was one of three Algonkin mothers taken in an evening raid in the fall of 1641 when the Iroquois wiped out a whole settlement above Montreal. A woman who subsequently escaped related to Father Buteux, whose account Vimont includes in the Relation of 1642 (Thwaites, 1896–1901, vol. 22, p. 257, *et passim*), these harrowing events. The next morning the Iroquois roasted the crying children and boiled them in a kettle and ate them before their imploring mothers.

"When the dismal band reached the great falls of the chaudiere—this is a river which falls into the River of the three meadows, above

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[37] Lalement, Relation of 1647 (Thwaites, 1896–1901, vol. 30, pp. 263–265).

Montreal" (Vimont)—this captive woman cast herself into an unfrozen section of the rapids, preferring to perish in the water rather than die by fire; but the Iroquois, running up to a spot where the rapids cast her up, succeeded in snatching and beheading and then scalping her before she managed to drown.

Case 32.—Young woman urged to marry attemps hanging: Algonkin, 1640.

We include another non-Iroquois case because it illustrates how Algonkin women employed hanging to escape male aggression where Iroquois women poisoned themselves. (See case 18.) Paul LeJeune writes of an Algonkin girl who tried to hang herself at Sillery near Quebec, 1640,

> A young woman, finding herself urged to marry a man whom she did not love, became so enraged, without showing any outward indications of it, that she tried to hang herself. People ran to her at once; they found her half dead; they cut the noose, and carried her, entirely unconscious to her cabin. A Christian . . . informed us . . . We asked her if she was not afraid of being damned. "I was not thinking of that . . . but only of freeing myself from the annoyance of that man."[38]

Case 33.—Iroquois prisoner attempts strangling to escape torture: Hurons, 1639.

Some Iroquois warriors also resorted to strangling to escape martyrdom; certainly, the following case shows that one attempted suicide as a welcome alternative to the idealized pattern of death by fire.

Lalement writes from the Huron country in LeJeune's Relation of 1639 (Thwaites, 1896–1901, vol. 17, p. 99) how on January 2, 1639, they almost lost the soul of an Iroquois prisoner who tried to choke himself on his last and fatal night 24 hours after they baptized him. They finally got him to accuse himself and ask pardon. "Having done this, he was granted absolution; and 2 hours later he was boiling in a kettle."

Case 34.—Chief's son loses at gambling and hangs himself: Hurons, 1639.

The Jesuits considered gambling a disruptive force in Huron society, and they describe both the Huron and Iroquois as greatly addicted to the evil pleasure which produced a harvest of assaults and murders, depending, probably, upon how individuals took their losses. Brébeuf writes to his superior at Quebec how the loss of the family wampum drove one melancholy lad to hang himself rather than face his relatives.

> On the fourteenth of April [1636], the son of Chief Aenons, after having lost at the game of straws a Beaver robe and a collar of four hundred Porcelain beads, had such a fear of meeting his relatives that, not daring to enter the cabin, he became desperate, and hanged himself to a tree. He had a very melancholy

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[38] LeJeune, Relation of 1640 (Thwaites, 1896–1901, vol. 18, pp. 163–165).

disposition. The first of the winter he was on the point of putting an end to himself, but a little girl caught him in the act. When asked what had led him to this wicked resolution, [he said] "I do not know . . . but someone within me seems always to be saying, 'Hang thyself, hang thyself.' " Gambling never leads to anything good; in fact, the savages themselves remark that it is almost the sole cause of assaults and murders.[39]

Case 35.—The sick beg mercy death, 1636.

Suicides were rather frequent among the Hurons during the recurrent epidemics of smallpox which struck the Huron towns from 1635–37 (Parkman, 1885, p. 87). In the Relation of 1636 (LeJeune *in* Thwaites, 1896–1901, vol. 9, p. 117), we read that they "beg to be killed when very sick," and in 1640, a Huron man sick with smallpox had himself stabbed twice and then swallowed an awl (Thwaites, 1896-1901, vol. 19, p. 171; vol. 18, p. 28).

EXPLANATION OF ABBREVIATIONS USED IN TABLE

COLUMN:

Case: Italic numerals in parentheses indicate frequencies known; with asterisk*, estimated frequencies; alone, data not included in cases.

Source: F, my own field notes; JR, Jesuit Relations.

Tribe: S, Seneca; M, Mohawk; Oa, Onondaga; Oe, Oneida; T, Tuscarora; D, Delaware; I, Iroquois; H, Huron; Mi, Miami; Mi/Oa, Miami at Onondaga; A, Algonkin.

Sex: M, male; F, female.

Age: ma, middle-age; yw, young woman; y, youth; m, adult man; ch, child; g, girl; ym, young man; om, old man.

Blood: fb, fullblood; mb, mixblood; fractions, degree of Indian blood where known.

x marks the incidence of the trait; in combination under certain columns it has the following specific meanings:

Revenge and mistreatment: xp, revenge directed at parents; xd, revenge of aged on descendants; xd followed by arabic numeral, incidence.

Sickness: xa, cause was old age.

Lover's leap: rr, railroad; mm, Maid of the Mist.

Reaction: st, a known strong reaction.

Under the general heading of *Methods*, xf indicates attempt at suicide and failure; xfx, first attempt at suicide followed by success.

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[39] Brébeuf, *in* LeJeune's Relation of 1636 (Thwaites, 1896–1901, vol. 10, p. 81):

ANALYTIC TABLE

Case data							Causes—Motives									Methods									
																Type A				Type B					
							Responses: love-motives			Avoidances				Recognition		Poisoning				Violent					
Case	Source	Date	Tribe	Sex	Age	Blood	Jealousy	Revenge and mistreatment	Dead	Enforced marriage	Martyrdom	Revenge	Sickness	Shame or vanity	Melancholy	Source unknown	*Cicuta*	Mayapple	Swallow objects	Strangle	Drown	Stab	Shoot	Lover's leap	Reaction
1	F	1902	S	F	ma	fb	x	x									x								st
2	F	1901	S	F	yw	mb	x	x									x								
3	F	1855	S	F	ma	mb		x									x								
3a	F	1889	S	F	yw	mb		x									x								
3b	F	1850	M	F	ma	mb		x									x								
4	F	1900	S	M	(?)	(?)											xf								
4a	F	1875	S	M	ym	(?)	x							x			x								
(2)	F	1920	Oa, Oe	F	yw	mb		x								xf									
5	F	1925	S	M	ma	mb	(?)																xf		st
6	F	1900	S	M	ma	fb?	x					x												rr	st
7	F	1875	S	M	ma	fb?						x		x						x					st
8	F	1890	S	M	ma	fb?						x								x					
8a	Wayne	1939	S	M	ma	mb									x					x					st
9	Wayne	1932	S	F	y	mb		xp															x		
10	F	1890	T	F	y	mb		xp													x			mm	st
11	F	1930	S	M	ym	7/8									x						xf		xf		
12(2)	F	1935	S	F	y&w	7/8		x					x		x										
(1)	Pierce	1925	S	M	?m	mb							x		x					x					
13	Seaver, p. 134	1817	S	M	m	fb						x		x			x						xf		st
(*2)	Pursh, 42	1800	Oa	(?)	(?)	(?)											xf								
14(*5)	Zeisbr., 83; Heck., 258	1771-80	D-I ?	4M&F	m	fb?	x	x									(?)	4x							

15	Lahon., 1: 250, 2:41	1684	I, Oa?	F&?M	(?)	fb			x									x							
16	Lafit., I: 603, 404	1710-20	I	F	y	fb		xp									x								st
17	LaPoth., 3: 16	1690	Oa	F	ch, g	fb		xp									x					x	x		
18	JR, 58: 239	1672	S	F	yw	fb		x		x															
19	JR, 57: 165	1672	Oa	F	w	fb	x	x																	
(1)	Penn, 210	1680	D	F	w	fb	x	x								x									
20	JR, 43: 271	1656	Oa	F&M	w&ch	fb		x, xp								x	(?)								
21	JR, 19: 173, 18: 27	1640	H	M	ym	fb									(?)	x	(?)								
22	JR, 14: 37	1637	H	M	ym	fb		xp									x								
23	JR, 13: 27	1636	H	M	ym	fb			x						x		x								st
24	JR, 8: 121	1635	H	M	ym	fb			x							x									
25	LaHon., 1: 178	1692	I	M	m	fb					x											x			st
26	JR, 62: 85	1682	Mi/Oa	M	m	fb		x			x								xf	xf					
27(*2*)	JR, 62: 63-65	1682	Oa	M	om	fb		xd2	x				xa							x					st
28	JR, 46: 37-39	1659	H	M	ma	fb					x											xf			
29	JR, 33: 125	1648	Oa	M	ma	fb					x			x								x			
30	JR, 33: 117	1647	Oa	M	m	fb					x										x?				
31*a*	JR, 30: 263	1647	A	F	w	fb					x									2f					
31*b*	JR, 30: 275	1647	A	F	w	fb			x		x									x		x			
31*c*	JR, 22: 257	1642	A	F	w	fb			x		x										xf				
32	JR, 18: 163-165	1640	A	F	yw	fb		x		x										xf					
33	JR, 17: 99	1639	I	M	m	fb					x									xf					
34	JR, 10: 81	1639	H	M	y	fb						x		x						xfx					
35(?)	JR, 9: 117, 164; 19: 171	1636-40	H	M&F	(?)	fb							xx						x			x			

(For explanation of abbreviations, see page 119.)

PART 3: ANALYSIS, DISTRIBUTIONS, AND CONCLUSIONS

We have now presented the information extant concerning the known cases of Iroquois suicide, and we have also presented earlier cases from the other related Huron-Iroquois Tribes, and a few Delaware and Algonkin incidents that seemed pertinent to our problem. The task now remains to answer the questions we posed as the problem for this study. Fortunately, two other scholars have reviewed the evidence from the sources on the Eastern Woodlands, removing much of the onus from our task: Wisse has considered the data from the area as a unit in a survey of the Americas by culture-areas, part of his scholarly world survey of Suicide and Fear of Death among Primitive Peoples (Wisse, 1933, pp. 159–185); and Dr. Flannery has assembled the principal references to suicide by taking a poisonous root in her indispensable Analysis of Coastal Algonquian Culture (1939, pp. 132–133, 181), coming to the conclusion from its limited distribution that the custom was probably original with the Iroquois.

We shall postpone discussing attitudes toward suicide until after we have summarized our data on frequency, causes, and methods of commission. There are between 39 and 50 known Huron-Iroquois cases spread over a period of 300 years, dating from 1635–1935. As compared with the maximum of 20 instances in 16 cases going back to 1850 that I was able to recover during field work, the greater number of cases, 22, come from the middle years of the seventeenth century at the height of the Huron versus Iroquois war, when there were some 20,000 Hurons and 15,000 Iroquois (Hewitt, 1912); and there are enough cases sprinkled through the 1700's to bridge the intervening century, conveying the impression of continuity of custom. Our records show an average of a case every 9 years for the whole period: One every 4 to 5 years since 1855 among the 3,000 New York Senecas, but we have also recorded attempts and failures; it is likely that many more than seven escaped the notice of eighteenth century observers, although Heckewelder reports four cases in 10 years (1771–80) for the Delaware, which Wisse (1933, p. 160) regards as a considerable frequency; and we find one every 3 years for the seventeenth century, about equally divided between the Hurons and Iroquois. There has been no marked increase in frequency during the last decade; in fact, the highest frequency seems to have occurred between 1635 and 1650 when the 20,000 Hurons were feeling the impact of European civilization through the epidemics of smallpox carried by the French traders and the Christian teaching Jesuits, and the torture and persecution of the Iroquois who had received rum and guns from the Albany Dutch. This interpretation, if correct, would seem to bear out the theory of modern sociologists who derive from the conditions leading to mass suicides their concept of social disorganization. As the recorded cases represent only a fraction of actual incidence, we cannot judge the actual frequency per 1,000 per year; we have only a clue to relative frequency from period to period.

Lacking a summary of Iroquois frequency, Wisse (1933, p. 161) assumes that the cases were relatively frequent on the grounds that the great variety of causes, discussed below, is proportional to frequency—as contrasted with but one Winnebago case—and he places the Iroquois, Hurons, and Delaware in column B (second rank) of his fourfold estimate of relative frequencies among primitive peoples, with the Onondagas in column C (Wisse, 1933, pp. 465, 467). Of greater significance, perhaps, would be a future study of the conditions leading to murder, rape, and incest, and the periodic changes in frequency of these counterpart crimes for which suicide might provide the escape.

Breaking the data down by tribes, among the Huron-Iroquois no one tribe has a monopoly of cases. For the periods for which there are data, they usually concern one tribe, and the frequencies by tribes from period to period are similar, excepting the modern Senecas who received intensive investigation, although we suspect that there were many more unrecorded cases among the Hurons about 1648 when the Five Iroquois nations combined to wipe them out. There are 7 plus Huron, 8 Onondaga, 4 generalized Iroquois, 1 Mohawk, and 16 Seneca cases.

Quantitatively, the Huron-Iroquois cases, excluding the four cases of Delaware men and four cases of Algonkin women, show no significant group differences between the sexes; whereas among the Algonkin and Saulteaux women's cases predominate; only men are reported from the Ottawa, and the other eastern woodland groups do not seem to be differentiated along sex lines (Wisse, 1933, pp. 188–182).

We do find interesting group differences between horizontal age grades. There are more than four references to children, whom observors categorize plurally without enumerating individual cases, but it is my impression that they were fewer than adult cases. There are 5 incidents of youths (male and female) and 10 of young men and women, 14 of men and women, and 10 of middle age, and 2 of old men. The toll fell heaviest on the younger men and middle-aged women; the former were liable to be warriors, gamblers, and drunkards, while the latter were liable to desertion and mistreatment, significantly enough about the time that they approached climacteric. Therefore, these female suicides might be interpreted as protests against recognizing the transition from the adult to old-age status when their lovers have given social recognition to their physiological passage.[40]

Our data do not point to any significant relation between fullbloodedness and suicide rate. Rather, suicide rate does not appear to increase with dilution, although mixed-bloodedness and culture conflict paralleled each other in the recent Seneca cases. However, we have no accurate measure, including genealogies for the recent generations of Senecas, of the extent of intermarriage; but it is likely that prior to 1700 we are dealing with full-bloods. The Jesuit Relations would be apt to tell us if any of the subjects were children of French fathers. Nevertheless, the question of degree of blood can be a factor preventing full participation in tribal society and, therefore, lead to suicide, as in case 10 of the Tuscarora girl whose parents prevented her marrying a white man, and it is easy to conceive how attitudes toward the children of such a union would not be favorable; but, unfortunately, I have no case of a mix-blood suicide growing out of tribal persecution.

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[40] This interpretation springs from reading Professor Linton's stimulating discussion of Status and Rôle in his The Study of Man. (See Linton, 1936, p. 119.)

Iroquois suicides as failures in adaptation may be classified accordingly as they fulfill response, avoidance, or recognition-seeking motives.[41] The love-motive, a response mechanism, figures in cases going back to 1635 either as jealousy, revenge of mistreatment, love of the dead, or escape from enforced marriage. Sometimes, several motives combine in a single case: Jealousy is combined with revenge of mistreatment in the type A cases of poisoning; women become jealous of a husband's new mistress and seek revenge through poisoning, as in cases 1, 2, 3, 3a, and 3b among the modern Senecas, and Mohawks, and cases 19 (1672) and 20 (1656) among the Onondagas. The same motive lies behind the suicides of four Delaware men (case 14) mentioned by Heckewelder, and one woman mentioned by Penn, 1680. Jealousy occurs 6 times, and spouse revenge 12 times, being the most frequent type of motive in our records. This is fundamentally an old pattern going as far back as there are records for women's suicides. However, we have no such cases among Huron women, but the love-motive arising out of jealousy and anxiety over betrayed love operates in women's suicides among the Central Algonkian Ojibwa, Sauk, and Ottawa (Wisse, p. 168).

Wisse suggests that the superior position of Iroquois women is a factor in the infrequency of love-motive suicides arising out of anger, jealousy, and anxiety. Actually, there are more cases than he suspected, and my informants have emphasized jealousy and anxiety as the love-motives behind suicides in revenge of mistreatment. The Seneca concept of romantic tragedy views suicide as the final instrument to which an Iroquois woman may resort to bring public opinion upon her errant lover. Thus suicide might be considered the counterweight opposing desertion in the patterned equilibrium of marriage, focusing an adverse public opinion charged with potential blood revenge, society's unconscious device for administering justice, on the guilty husband.

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[41] Wisse has grouped the causes of these suicides as: Desire to escape physical suffering, insult or injury, unfaithfulness of loved-ones, and out of love of another; but my own thinking has been largely influenced by W. I. Thomas' concept of the "Four Wishes" (new experience, response, recognition, and security) that lies behind his recent treatment of data from early societies in Primitive Behavior, (1937, see especially p. 358), and his earlier essay, The Configurations of Personality (1928, pp. 145–148).

The motive of revenge for mistreatment extends beyond love affairs to response situations between generations. As early as 1637 among the Hurons (case 22), there are child suicides revenging punishment or parental mistreatment. Children are seldom punished today, and we find the historical explanation of the customary parental attitude in the seventeenth century fear that they might kill themselves by taking a poisonous herb, usually *Cicuta*, or, less often, shoot or hang themselves. Then, the indulgent attitude of Iroquois parents toward their children, whom they seldom punish and then only to throw water in their faces, is the reciprocal of children's potential revenge seeking in the patterned relationship between the end-point statuses of parent and child. Wisse explains child suicides as due partly to fits of anger growing out of personality variables determined before birth. He would, I gather, attribute them to congenital factors (predispositions) plus culturally determined values such as revenge seeking, the result of an attitude of sensitivity to personal injury, a prime Iroquois value from early days forward according to Dablon, Lafitau, and my own field experience. (Wisse, 1933, pp. 171–172; Dablon, 1676, *in* Thwaites, 1896–1901, vol. 60, p. 287; and Lafitau, 1724, vol. 1, p. 603.)

That children might grow up to mistreat their parents is another stock excuse the Senecas give for not disciplining their children. While it is suggestive that the number of cases where Iroquois adults have maltreated their aged parents is great enough to warrant investigation, we have only two suicides of old Onondaga men in revenge of abuse at the hands of their descendants (case 27, Onondaga, 1682). In one of these cases, the secondary cause was his love for his deceased wife. Here we have the converse of the patterned relationship between parent and child explained above because here the relative statuses have been advanced a generation and the mistreatment reversed. Suicide becomes an escape for the lower and upper generations from the abuse of the middle generation.

The Iroquois love their dead. Whether we read the Jesuit accounts describing the care which the Hurons lavished on their dead ancestors' bones before burying them in huge ossuaries at the Dead Feast, or observe the behavior of modern Senecas during the long wakes preceding burials, or listen to the funeral orator warn the mourners to bury their sorrows in the grave, or hear out the monotonous songs of the Chanters for the Dead, a ceremonial prophylaxis to remove thoughts of the dead from the minds of the living, we discover background materials lending symbolic meaning to early suicides following the death of a near relative. Our four cases come from the seventeenth century. Commencing with the earliest case in the Jesuit

Relations (case 24, Huron, 1635), a Huron kills himself over the death[?] of his wife, and the case of the melanchony young chief who took *Cicuta* over the death of his son (case 23), they end in 1684 with Lahontan's eulogy on the amazing constancy of Huron-Iroquois spouses (case 15). For some of them love of the dead may have been a principal cause, but whether they really thought they could follow the dead to the spirit world is irrelevant to the actual deed which was more likely motivated by a fixation on the dead, bolstered by the Iroquois belief in the compulsive power of the dead over the living. This is seen in a number of modern suicides where murder arising through jealousy suggests the sequence of self-destruction (cases: 5, 6, 7, 8, and 13). Perhaps the Iroquois feel the compulsion which the dead exercise over the living less than they did in the seventeenth century when Lahontan observed the unequivocal case of an Iroquois who killed herself to follow her husband (case 15); but Lahontan explains that this spouse sequence was not obligatory unless the soul manifested its uneasiness in the spirit land by causing the survivor to dream twice within 6 months, in which case the survivor sang the Death Song and went cheerfully. At the present time, the Society of the Chanters for the dead still operates to free the survivor's mind of any compulsion to follow the dead. Spouse suicides were a voluntary pattern condoned during the seventeenth century and successfully circumvented in the twentieth; and our records are incomplete for the eighteenth and nineteenth. Also we are unable to know how many men simply went to war and got themselves killed following the death of a near relative.[42]

Suicides out of love for the dead are reported also from the Algonkin (case 31, *b* and *c*), Ojibwa, Ottawa, Pottawatomi, and Saulteaux (Wisse, 1933, pp. 166–167).

Suicides to escape enforced marriage are uncommon with the Iroquois, although they are reported from the Algonkin tribe (case 32) and possibly the Seneca (case 18, 1672). Among the Iroquois, the mothers arranged the marriages, divorce was easy, and remarriage regular. Probably, as Wisse suggests (1933, p. 170), the lack of such cases reflects the more favorable position of the Iroquois woman. Enforced marriages are certainly not consonant with a strong clan feeling which would resist aggression of outside males, and between clans the mothers attempt to build permanent bonds through effecting workable marriages. However, we have the one Tuscarora case where the family induced a suicide by preventing a desired marriage with an outlander, a white man (case 10). However, suicides to escape marriage were found among the Ojibwa (Catlin, 1841, vol. 2, p. 143) and Delaware (Schoolcraft, 1851–57, vol. 5,

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[42] I am indebted to Dr. Julian H. Steward for this observation.

p. 683); and the seemingly Algonkin lover's leap parallels the Maid of the Mist as a typical trait.

Avoidances, the second general class of causes or motives, embracing desires to escape martyrdom, punishment, or revenge, and suicides of the sick, raise a paradox. In the Eastern Woodlands, as on the Plains and in the Southeast, the regular pattern was for brave warriors to seek glory or death in warfare. This meant that regularly normal men died by torture without fear of death. Yet, the dishonor that attached to being taken captive and the love of freedom and dislike of restraint, that we have seen characterized Iroquois child rearing, led warriors, says Lahontan (1703, vol. 2, pp. 79–80), to kill themselves rather than be taken captive. For this reason, Wisse (1933, p. 161) holds that suicide to escape torture was a secondary motive. Yet some Iroquois individuals did not conform to the norms set for them by their culture and committed suicides to avoid painful deaths. Thus we have an alternative pattern for escaping the traditional definition of the situation—the ideal pattern. We have three cases of Iroquois men who killed themselves from fear of martyrdom: The Iroquois facing torture among the Hurons who attempted to choke himself (case 33, 1639), the Iroquois who dove into the Huron kettle of boiling water, 1647 (case 30), and the cowardly Iroquois who stabbed himself at Quebec, 1692 (case 25). All of these come from the 1600's; there are probably other later cases. We see a similar motive in the Miami who attempted to swallow stones (case 26) and later choke himself, the Algonkin women who drowned or attempted to hang themselves lest they be burnt (case 31), and the Pequots who in despair rushed into their burning houses to avoid capture (DeForest, 1851, p. 133). This type of suicide appears among Iroquois, Algonkians, and Sioux.

The recent type B suicides to escape the consequences of violent murders, either punishment or blood revenge, are the modern variants of the old seventeenth century pattern of avoiding martyrdom by suicide. Cases 6, 7, 8, and 13 all follow the desire to escape revenge, avoid capture, or efface loss of status.

Suicides of the sick parallel the former cases as efforts to avoid or foreshorten a painful death. Here come the many cases from the years of the Huron smallpox epidemics: The sick Huron who had himself stabbed twice, and then swallowed an awl (case 35); and related to these are the suicides of the aged (case 27). This type of suicide seems more common among the Algonkin, Ojibwa, Saulteaux, and Pottawatomi who lived closer to the border of starvation.

Suicides registering a feeling of lost status or recognition that involves the motives of shame and vanity, or a feeling of status or recognition never attained, as in the few cases of chronic misanthropes, are not many among the Iroquois. One might interpret the love-motive suicides of women who have lost husbands as an expression of lost status, as in the case of the Seneca lover who lost his bride (case 4a). Shame is a motive in the case of the horse thief (case 7); the murderer of Mary Jemison's son (case 13); and in two early cases, the Onondaga ambassador (case 29), 1648, and the melancholy Huron who gambled away the family wampum (case 34). Vanity appears also in the latter cases. Melancholia induced by drunkenness operated in the recent case 8a of the Seneca sachem. Gamblers committed suicide in Connecticut (DeForest, pp. 16, 17), and melancholy seems to have been a cause with the Algonkin, while shame was a motive with the Ojibwa, Ottawa, and Delaware (Wisse, 1933, pp. 172–174). This type of suicide is hardly typical of the Iroquois, at least in the light of the present evidence.

Wisse (1933, pp. 174–175) has summarized the motives with some overlapping and has given their distribution by tribes. Taking his data together with ours, the following tribes furnish one or more illustrations of suicides recognizing lost status—wounded pride, injured honor, jealousy, and vanity (Wisse holds that loss of self-esteem leads to revenge suicides): Micmac, Ojibwa, Ottawa, Sauk, Delaware, Huron, and Iroquois (Mohawk, Onondaga, and Seneca), and Tutelo (Byrd). Avoidances of physical suffering—for reasons of age, sickness, fear of martyrdom or gruesome death, mauling, and hunger—occur among Algonkin, Miami, Pottawatomi, Ojibwa, Saulteaux, Shawnee, Pequots, Huron, and Iroquois (Onondaga and Seneca). Suicides in response to unfaithfulness of love mates (and here Wisse includes love of freedom and enforced marriages as sharing common nobility of feeling), are distributed among Algonkin, Ottawa, Ojibwa, Sauk, Winnebago, Delaware, Shawnee (Voegelin), Ontario [?], Huron, and Iroquois (Mohawk, Onondaga, Seneca, and Tuscarora). These distributions are too widespread to be diagnostic for our purposes. However, Wisse groups Saulteaux, Ojibwa, Ottawa, Huron, and Iroquois cases together in a fourth category because these neighboring tribes share suicides growing out of love for another. I would interpret this as a northern Great Lakes area type motive since two of our four Huron-Iroquois cases are from the seventeenth century Hurons, and we have only one definite Iroquois case, and the custom seems to have gone out of vogue 50 years after the Huron dispersal. It is consistently Iroquoian only inasmuch as it fits their emphasis that the love motive is the only legitimate reason for suicide. The more typically Iroquoian love suicides are those of women who poison themselves to revenge unfaithfulness, a pattern that is continuously distributed over a limited area south from the Iroquois proper among Iroquois (Mohawk, Oneida [?], Onondaga, Cayuga, Seneca, and Tuscarora), Delaware, and Shawnee [?] (Voegelin).

Our cases are about equally divided between poisoning (type A) and violent methods (type B). Our data show 24 instances of poisoning: 10 men and 14 women. We are in doubt what poison 5 used, although 3 of these took herbs; 14, plus-or-minus 2, took *Cicuta*, which seems to have been the favorite with Iroquois women and a few men after 1672; and it was taken by Huron men as early as 1636, with the likelihood of contemporary use among the Iroquois; and 5 took mayapple, but 4 of these were Delaware men. Poisoning offered 14 to 10 odds for women over men, and odds were probably greater because women mentioned plurally are counted once. Byrd reports a Tutelo woman who ate trumpet plant root to protest a hanging (Byrd, 1929, pp. 310–312). Wisse and I are in agreement that poisoning was the most common method among the Huron, Iroquois, and Delaware. The difference in the Iroquois cases is that predominately women killed themselves in this way, and there are relatively few references to men. Lahontan suggests that surviving male spouses took poison, as did Mary Jemison's son's murderer (case 13).

Hanging or strangling is the next favorite method. Our data indicate 12 attempts and 5 failures, of which 3 are cases of Algonkin women (cases 31 a, b, and 32). The four recent Seneca hangings are males, two of whom avoided the consequences of violent crimes (cases 7 and 8); whereas a Miami attempted strangling at Onondaga, 1682 (case 26), and an Onondaga hanged himself to end old age (case 27) causing a stir that points to the rarity of these cases; and we have one isolated Huron case following gambling (case 34). Hanging was a favorite method with the Algonkin tribe and among the Micmacs of the Gaspé (Le Clercq, 1910, p. 247), along with drowning which was similarly uncommon among the Huron and Iroquois: The single Onondaga who plunged into a Huron kettle is hardly typical (case 30). However, three Onondagas and two Hurons facing torture attempted stabbing, one failing, and one Algonkin woman succeeded prior to 1690. After 1690 there are five attempts at shooting, including three failures. In the modern period, knife suicides gave way to gun suicides; perhaps the change was facilitated by the improvement of shorter firearms. These cases are more common later on the Plains. We have only one lover's leap, the Maid of the Mists (case 10), and one male who cast himself under a train (case 6).

"Suicide in any form [is] unknown among the far Northern Algonquians" (Flannery, 1939, p. 132).

If we look to the Southeast for the sources of Iroquois poisonings, we find only Byrd's report of the lone Tutelo King's daughter who ate the root of trumpet plant to protest a hanging and because she feared she might be mistreated as the last of her nation (Byrd, 1929, pp. 310–312). Olbrechts reports suicides as rare but not unknown among the Cherokee who, like their linguistic Iroquoian cousins, find illness or incurable love troubles principal causes. A suicide causes a tremendous commotion, but there are no especial beliefs connected with the fate of the ghost. Olbrechts (1932, p. 144) could find only three cases, all men. Two shot themselves, and one strangled himself with a rope, while he was told that Cherokee women chewed and swallowed the roots of *Cicuta maculata* L. for 4 days consecutively to put an end to their conceptive abilities. I can well imagine, if there is anything to our Iroquois cases, that they might, as they allege, "become sterile forever" (Olbrechts, 1932, p. 117). Among the Alabama suicides were deprived of burial and thrown into the river; a suicide was considered a coward.[41] Suicides were relatively uncommon among the Chickasaw, according to Cushman, and the rifle was the favorite instrument of death (Swanton, 1928 b, p. 232). The only thing that approaches our northern cases of root poisoning is the custom of lovelorn women drinking "bitter" cassava water in Guiana, and the reports that the natives committed suicide on a wholesale scale at the time of the Spanish conquest (Roth, 1924, p. 560).

Eating wild parsnip root, a species of *Cicuta,* was an accepted mode of committing suicide as far afield to the west as among the Atsugewi, Achomawa, and Surprise Valley Paiute of northeastern California (Voegelin, 1937, p. 456).

There is one other possible relationship with the southeastern custom of murder by administering poison which may have worked its way north to Virginia in the 1600's from the country of the Siouan peoples. The Chitimacha killed enemies by poisoning springs, as did the Indians of Virginia and Carolina, where it was not uncommon for a chief to make way with the heir to his position, if the latter did not please him, by administering a poisonous plant (Swanton, 1928 a, p. 697). However, there are no reports that individuals poisoned themselves, nor have I discovered instances of Iroquois poisoning their enemies.

We are left, then, with the conclusion that suicide by taking a poisonous root is an Iroquois culture trait that we have not succeeded in deriving from any other ethnic group outside of the area in which the Huron-Iroquois Tribes were living in the seventeenth century.

Let us turn to the first question concerning traditional attitudes toward suicide as a value. Modern Senecas consider it a deplorable act and convey the impression that formerly there were fewer cases, but they recall cases of women who poisoned themselves and men who sought violent deaths after murdering someone. Everyone reproaches the murderers but they condone those unsuccessful lovers who succumb to the compulsive attraction of taking waterhemlock. The rich lore surrounding this plant alone attests its long use; considering cases going back to 1635, its use must be aboriginal. Nevertheless, we have information that suicides sometimes created strong public reaction. When women kill themselves society reacts hostilely by gossiping about the shameful behavior of the deserting lover and takes no action (case 1). While it may react strongly to suicides of murderers and thieves, it is comfortably relieved because it need not take action (cases 5, 6, and 13), and the ultimate suicide merely deepens the initial tragedy. Since Iroquois society values ties of consanguinity above conjugal links, grief attending spiteful child suicides was especially bitter (Lafitau, case 14); and likewise, when housemates and community drunks persecuted two old men to death in the same year (1682), Onondaga village expressed its horror to the relatives and the adopted cabin mates (case 27). One other warrior condemned his fellow's suicide as cowardice for not fulfilling the ideal pattern of stoically enduring martyrdom.

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[41] Swanton, 1928, p. 397, citing Bossu, Nouv. Voy., vol. 2, pp. 49–50.

The individual himself manifested varying attitudes toward suicide. He might know all the traditional attitudes against the act, even having heard that it would exclude him from the land of souls, and yet perform the act in the traditional manner when circumstance demanded. Therefore, we cannot take too seriously the theory of a society whose tradition furnishes nicely patterned means for violating its values. Nevertheless, we may inquire whether the belief that souls of suicides are excluded from the land of the dead is aboriginal. Handsome Lake's followers believe the creator has alloted the days each shall live and that suicide will render their souls earth-bound. On the surface one might suspect that this is the mark of early Jesuit teaching, but while I do not deny Christian influence, I think that very likely part of the belief antedates missionary teaching. Cornplanter's version of Handsome Lake's Code devotes half its length to admonishing the people about values that were commonly disregarded in daily life during the prophet's time, 1735–1815, and the balance of the message describes his journey to the sky-world, a traditional type of visionary experience, during which he witnesses rewards reminiscent of the Book of Revelation, which his Philadelphia educated nephews read to him. But the code offers us negative evidence on suicide. The prophet inveighs against behavior that might furnish suicide motives—man deserts wife, man's jealousy of children, wife's mother slanders daughter's husband, wife beating, gossip wife was unfaithful during husband's hunt, polygamy, child punishment, drink, discrediting own child's legitimacy, and unkindness to aged—but he does not treat of suicide directly (Parker, 1913, pp. 30–35). In the later sections, he preaches the concept of allotted life, but does not describe suicides as being punished in the House of Torment (Parker, 1913, pp. 49, 57, 68–73, 107–109). Nevertheless, Edward Cornplanter, Parker's informant, told his son, my informant, that souls of suicides remain earth-bound, and probably he sometimes included this warning when reciting the code. Mary Jemison narrates that Senecas living along the Genesee in 1817 believed that suicides deprived their souls of good hunting in the land of the dead and excluded themselves from entering cabins where the good and brave warriors dwell. Yet learning this doctrine did not prevent a murderer from ultimately taking *Cicuta* (case 13). The Delawares a generation earlier had no especial prejudices in the matter (case 14). Lafitau, with a century of Jesuit experience behind him, cites suicides that occurred despite the belief that they received differential treatment in afterlife according to manner of death, that souls of suicides were separated from the other souls and had no communication with them (case 16). This belief extends back to the early seventeenth century and can hardly be reconciled with the contemporary belief that surviving spouses could follow their love mates to the land of souls when summoned repeatedly through dreams. However, ethnology no longer tries to resolve all the conflicts in its data because ethnologists have demonstrated that societies often furnish mutually contradictory patterns for the individual to follow. Our own notions concerning the destiny of souls are almost as contradictory as those held by the seventeenth century Iroquois (Wolf, 1919, p. 44). We might expect more variation concerning knowledge of the supernatural than about elements more closely connected with the daily life of the people.

Charlevoix, contemporary of Lafitau, recorded the belief that souls of those who meet violent deaths have no commerce with the rest, that survivors burn or bury the bodies immediately and never lay them in the common burying ground, and allow them no share in the Feast of the Dead (Charlevoix, 1761, vol. 1, p. 192). Bressani's Huron Relation of 1653 was probably Charlevoix's source, for Bressani claims to have more than once seen those who die a violent death burned or buried immediately, and that not even those who freeze to death are removed for subsequent ossuary burial at—

> the feast of the dead,—they believing without reason that the souls of those unhappy ones who died miserably either in war, etc. [which probably includes suicides and tortures], have no communication in the other life with the other souls.[44]

Brébeuf, relating in 1636 what the Huron opinion is regarding the nature of the soul here and hereafter, corrects his statement of the previous year.[45] His 1635 information based on mythology made no mention of punishment or reward in the afterlife, and he concluded that they made no ethical judgments; and they made no distinctions in burying suicides as they had observed in the case of a young man who had poisoned himself to follow his recently deceased wife, a pattern the Huron condoned in Lahontan's time (1692). But his later report describes souls migrating to a large village toward the setting sun, except souls of small children and weak-limbed aged who remain, unable to make the journey, about old villages to harmlessly bang cabin doors; and each nation has its particular village from which they exclude aliens.

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[44] Bressani, 1653 (Thwaites, 1896–1901, vol. 39, p. 31).

[45] Brébeuf, 1635, 1636 (Thwaites, 1896–1901, vol. 8, p. 121; vol. 10, p. 145) (case 24).

> The souls of those who died in war form a band by themselves; the others fear them, and do not permit them entry into their Village, any more than to the souls of those who have killed themselves. [Brébeuf *in* Thwaites, 1896–1901, vol. 10, p. 145.]

This leaves the souls of suicides without a destination, having no village of their own, a belief that persisted to Mary Jemison's time (1817) and until recently among the Senecas. Therefore, they must remain earth-bound. The Hurons were still living their aboriginal life despite the intermittent efforts of Recollects after 1615 and the sustained efforts of the Jesuits, 1626–50, following Brébeuf's advent among them; and their beliefs about the destiny of souls had been little affected by Christian teaching. The Hurons held two conflicting patterns of thought regarding souls of suicides—that spouse would follow spouse to the spirit world when summoned through dreams, which Huron culture valued above all other portents, and that souls of suicides remained earth-bound, excluded from towns of warriors and ordinary dead in the land of souls.[46]

Catholic doctrine supplemented native beliefs, and the Jesuits sowed the doctrine of sin where natives lacked any especial beliefs about the fate of their souls following suicide. Further, baptism for remission of sins saved the souls of those who, having sinned, confessed and repented. This must have given some comfort to those who desperately poisoned themselves and had misgivings about the fate of their souls (case 21). The fathers used every opportunity to instruct the natives. When a Huron woman felt compassion for a Seneca whom they were torturing (1636) and asked LeMercier if there could be harm in his committing suicide—

> The Father instructed them fully upon this point, and showed them that God alone was the master of our lives, and it was for him only to dispose of them; that those who poisoned themselves or made away with themselves by violence committed a grievous sin; and that Saouandanoncoua . . . would lose the fruit of his baptism, and would never go to Heaven, if he hastened by a single moment the hour of his death.[47]

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[46] Hewitt came to a similar conclusion (1895, p. 1), but his published statement is ambiguous and misled Wisse (1933, p. 177), while his original manuscript (Misc. Notes relative to the state of the Soul after death, etc., Ms. No. 3638, Bur. Amer. Ethnol.) indicates that Brébeuf and Lafitau, whom I have cited, and Sagard and LeJeune were his sources. Following Brébeuf, he states, the war dead as well as suicides "have separate villages, not being allowed to visit the others, since these fear them"; but in compacting Brébeuf, he misquotes him.

[47] LeMercier, 1637, *in* Thwaites, 1898–1901, vol. 13, p. 59.

This teaching, coming later the same year that Brébeuf wrote, probably consolidated the older Huron belief. It may also date the introduction of the concept that God is the master of lives, a function the Hurons had already ascribed to their cosmological heroes (Hewitt, 1912) which readily attached itself to existing Huron belief, for in 1659 a Huron about to cut his throat recalled the Catholic teaching that man does not control his life and threw away the knife (case 28). By 1677, Cholenec reports how various Mohawks, Onondagas, and Hurons near Montreal have learned in the church to overcome cultural hypersensitivity that formerly led to revenge seeking or suicide (Cholenec *in* Thwaites, 1896–1901, vol. 60, pp. 287–289). Jesuit influence supplied religious sanctions to suicides where they were lacking among the Algonkin, as among the Delaware; it clarified Huron-Iroquois thinking by buttressing the ideas of differential status in heaven and the Creator as the controller of life by teaching that God is the master of lives. This may have led to the concept of allotted life and suicide as a sinful act. At any rate, by 1700 spouse suicides had ceased and the frequency of other suicides was lessening.

Conclusions.—An ambivalent Huron-Iroquois attitude toward suicide as a value crystalized into open hostility under Christian teaching. A definite concept of allotted life and exclusion from the land of the dead resulted. The latter belief was aboriginal. Public opinion condemned as cowardice male suicides to avoid physical suffering, such as torture, but condoned cases of women who were mistreated by lovers. The greatest frequency came during the period immediately following white contact when conditions were ripe for social disorganization. We have not found a higher rate of mixblood suicides over fullbloods, nor any appreciable increase in recent years. The principal motive with women was revenge of mistreatment by husbands who deserted them at middle age; children resented restraint, and men sought to avoid physical suffering, either martyrdom or blood revenge; some cases involve loss of status. Poisoning was the favorite Huron-Iroquois method, and *Cicuta* has remained the suicide root during 300 years, with mayapple running a close second; women prefer poisoning and men are more apt to seek violent ends, such as strangling and stabbing, which gave way to shooting after firearms were introduced. Finally, the remarkable fact in Iroquois suicides is not the change that has followed the impact of European cultures but the stability of fundamental suicide patterns throughout the entire period of contact. The same motives, the same methods, and similar beliefs concerning the fate of souls prevail. Danger of capture and torture ceases with the wars, and blood revenge is giving way to white law enforcement on the reservation: The onus is shifted but throughout avoidance remains the dominating motive.

Cases in revenge of mistreatment continue to arise in love-response situations, child suicides are now infrequent, and spouse suicides disappeared by 1700. Pattern then serves as a cultural continuant for custom, antecedents have already defined the situation for the individual, and once a fundamental pattern becomes established it tends to persist despite substitutions within its framework. The unconscious nature of pattern and the illogical character of cultures are shown by the fact that social systems may offer the individual patterns as guides for his conduct that lead to the fulfillment of mutually opposite values.

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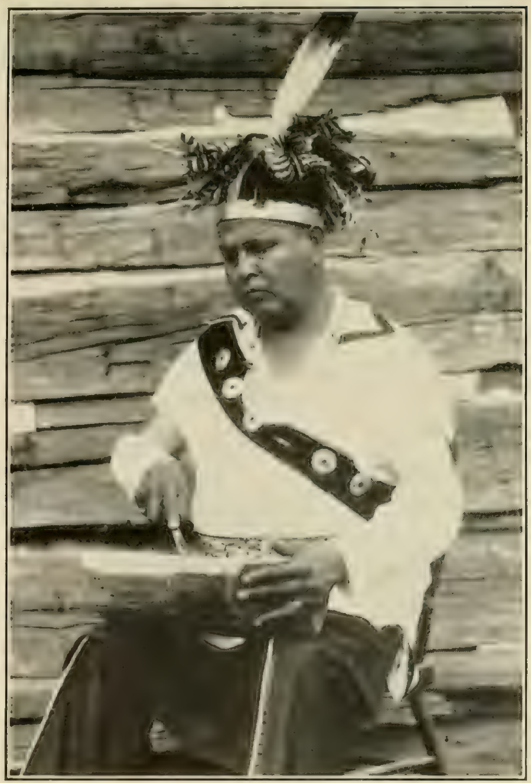
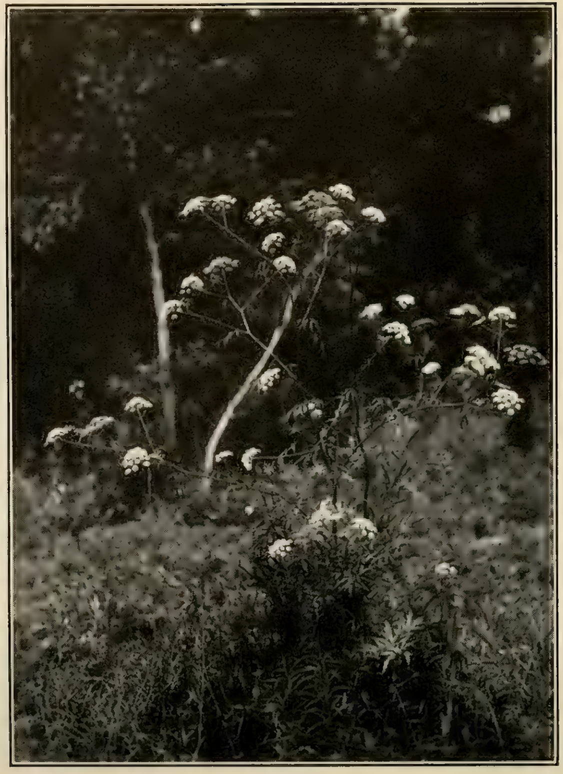


1. Jesse J. Cornplanter, Seneca, of the Tonawanda Reservation; author and informant on Seneca customs, wearing the white shirt and sash of a Long House Speaker and the whirling feather headdress of the Senecas. (From frontispiece to Cornplanter's "Legends of the Long House.")

2. Rev. Peter W. Doctor, ex-chief of the Tonawanda Band of Senecas, and one-time pastor of the Presbyterian Church; informant on suicide.

3. Abbie Brooks, Tonawanda Seneca, informant on the unsuccessful attempt of her father's brother.



1. Waterhemlock, *Cicuta maculata* L., "Whitefeather" to the Mohawks, "fatal root" in Iroquois suicides since 1623, growing in a wet pasture near Quaker Bridge, Allegany Reservation, N. Y.

2. Sarah Snow, Seneca herbalist of Quaker Bridge, Allegany Reservation. Her mother's mother took "the root."

1. Kate Debeau (D'Ailleboust), Mohawk herbalist and midwife of Caughnawaga, P. Q.; informant on cases of Mohawk suicide.

2. Simeon Gibson, principal informant on Cayuga-Onondaga dialects and customs at Six Nations Reserve, Ontario.

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Tonawanda Longhouse Ceremonies: Ninety Years After Lewis Henry Morgan

By WILLIAM N. FENTON

PHONETIC NOTE

The orthography employed in this paper is the same as that used in An Outline of Seneca Ceremonies at Coldspring Longhouse (Fenton, 1936). It reduces Seneca transcription to a minimum of characters required by the economy of the language. The vowels: *a* (of English *father*); *ä* (of English *hat*); *ϵ* (of English *met*); *e* (of French *ete*); *i* (of French *fini*); and *o* (of English *mote*) may later be reduced to four: *a*, *e*, *i*, and *o*. They occur frequently in diphthongs and less frequently in triphthongs. Nasalization is denoted by a hook beneath the vowel: Vowel length by a raised period after the vowel. A raised comma indicates the glottal stop. The character *š* is *c* (of English *shoe*); affricatives vary between *dz* and *dj* (of English *adze* and *judge*) depending on the speaker; *s* and *t* are ordinarily somewhat aspirated; heavily aspirated *s* and *t* are followed by *h* (e. g., *sh* and *th*); *h* everywhere indicates aspiration; and *T* indicates a terminal whispered *t* which is articulated after a glottal stop in a few words.

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TONAWANDA LONGHOUSE CEREMONIES: NINETY YEARS AFTER LEWIS HENRY MORGAN[1]

By William N. Fenton

METHOD

During 30 months, February 1935 to September 1937, I was in almost daily contact with the Tonawanda Band of Senecas. Although occupied with official duties, I nevertheless witnessed the entire cycle of ceremonies that Handsome Lake's followers have perpetuated at Tonawanda longhouse. At odd moments older Indians explained the present form and content of the rituals; they indicated unique features of the Tonawanda cycle; and they suggested possible changes in the last 100 years.

I have followed the method which Dr. Frank G. Speck devised for recording the Cayuga yearly ceremonial calendar at Soursprings longhouse, which proved convenient for recording rituals at Coldspring longhouse, classifying my field notes, and presenting a summary of results (Fenton, 1936).[2] This approach reveals that although the same dances are shared by neighboring longhouse groups, patterning of the ceremonies differs from group to group; and that each longhouse repeats its ritual pattern several times during the yearly cycle. The yearly cycle is outlined, indicating the time, duration, and purpose of each festival; and the composition of ceremonies is listed day by day. Analysis of prayers reveals an Iroquois Pantheon of three orders: Spirit-forces on the earth, a midpantheon of appointed spirits above the earth, and an upper pantheon of forces controlling the universe. Prayers and thanksgiving songs, addressed to the unseen spirit world, commence on the earth and run the whole fixed gamut of stations upward to the Creator. Specific rites fall into three groups according to their function of bringing man into rapport with particular spirit-forces. There is a group of worship rites addressed to the Creator, others to the spirits of cultivated plants; a group of medicine-society rites concern man's relation to specific earth-bound tutelaries, frequently animals; and some societies restrict participation in their ceremonies to members only. The remaining rites fall under the general rubric of social dances which lack any direct religious purpose.

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[1] This paper was delivered in part, as "The Pattern of Seneca Ceremonies at Tonawanda Longhouse," before section H of the American Association for the Advancement of Science on June 16, 1936, at the University of Rochester. The present draught was read December 27, 1936, at the annual meeting of the American Anthropological Association at Washington, D. C.

The data presented here were collected during field trips spread over several years. The study began in 1934 with grants-in-aid of research from the Institute of Human Relations at Yale University, and it continued from 1935 until mid-1937 while I acted as Community Worker for the United States Indian Field Service in the New York area. Thanks are due Prof. Edward Sapir of the former institution and John Collier, Commissioner of Indian Affairs, for their sustained interest in my Iroquois researches. My greatest debt is to my Seneca friends: Jesse Cornplanter, Cephas Hill, Rev. Peter Doctor, Chief Henan Scrogg and the "Salt Creek Singers," a mutual-aid fraternity at Tonawanda, who in accepting me for membership anchored my labors to the rock of tradition.

[2] Dr. Speck's monograph is still unpublished.

Work at Tonawanda has been a projection of a program to obtain comparable data for all Iroquois ceremonial groups, trusting that the facts may ultimately lend themselves to historical interpretation. The approach recognizes an intense feeling of localism, which informants voice in their replies to data obtained at other longhouses. Therefore, with Lewis Henry Morgan (1901, vol. 1, 175 ff.) as my illustrious predecessor among the grandfathers of my oldest Tonawanda informants, I commenced work ill-prepared to discover vestiges of an even richer ceremonial life after 90 years of supposed deculturation.[3]

THE LONGHOUSE

The present Tonawanda longhouse, situated "down below" near the northwest end of the reservation, was built in 1876.[4] It is near the site of an older, log longhouse which still can be distinguished by an elliptical indentation near the present road where the feet of many dancers, emerging at intermissions to cool off and gossip, wore a path about the sunken foundation. South toward Indian Falls, another log longhouse stood on Sand Hill where the road emerges on a plateau. About 1870, the Faithkeepers tore it down in anticipation of erecting a new building of matched lumber, but, at that time, most of their membership passed over to the Christian party. No one now living remembers a third ceremonial longhouse which formerly stood in the middle of the original Tonawanda settlement of bark houses on the south bank of Tonawanda Creek near the canal feeder. As might be expected, where the longhouses were, at most, an hour's walk apart, the yearly round of ceremonies is said to have been identical.

THE CALENDRIC CYCLE

The Tonawanda Senecas observe seven religious festivals of thanksgiving. The yearly cycle commences at midwinter on the fifth day of the new moon called ni·sgo'wakne when the Pleiades are on the meridian at dusk. This moon, when the game commences to rut, anciently marked the end of hunting and winter removal and witnessed the return to sedentary village life.

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[3] For ceremonies at Newtown longhouse, Cattaraugus Reservation, see Parker, 1913.

[4] Charles Blackchief, well over 80 years old, remembered that the lumber for the present building cost about $500, which the Faithkeepers raised by conscription of annuity moneys among the longhouse party; they have twice reshingled it.

Seven days are devoted to renewing rituals of shamanistic medicine societies as revealed in old dreams, celebrating new dreams, and returning thanks to the Creator for life and sustenance, and praying for an early spring. A lineal descendant of the shamanistic orgy, called the Feast of Fools by the Jesuits among the Hurons, the concepts of confession and renewal dominate the festival. Public confession of sin precedes the festival; and dreams are revealed and must be celebrated lest someone take sick and delay the coming of spring. Renewal implies "new fire," the repetition of every known ceremony and dance; it underlies the White Dog sacrifice, and especially the rites associated with the planting, germination, progressive growth, and harvest of cultivated plants.[5] Thanks-to-the-maple, or the Sap Dance, follows when the sap is collected from groves preempted by individual families. The Planting Festival, or Seed Dance, occurs early in May to soak and bless the seed before returning it to the earth. The Berry Festival, or Strawberry Dance, returns thanks for the first fruits ripening on earth. The Green Bean Festival, or String-bean Dance, celebrates the ripening of the first cultivated crop in August. The Green Corn Festival repeats the latter days of the Midwinter Festival, returning thanks that the crops have matured; and the Harvest Festival, or Bread Dance, late in the fall after harvesting and storing the crops for winter, completes the cycle before going into the woods on the fall hunt.

The Tonawanda people formerly held a sun-shooting ceremony to dislodge from the sun a frog which they believed masked the orb and retarded the approach of spring. And then, in time of drought, the thunder ceremony, which Morgan describes, is still resorted to for rain. A priest burns tobacco imploring the Thunderers to water the crops and men dance the War Dance (wasa'·se). During the recent dry summer (July 10, 1936), the ceremony failed to bring immediate rain, because, according to the faithful, "Too many people are wicked now!"

PERIODIC CURES AND RENEWALS

Aside from their frequent public appearance during the Midwinter Festival, the False-face Company occasionally appears in early spring and late fall to drive pestilences from the settlement. The Little Water Medicine Society meets on the fifth night of the Berry Moon

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[5] Wissler (1917) has indicated a northern provenience for the medicine-bundle type of shamanistic societies allegedly derived from earth-bound animals, and he has suggested that the idea of renewal dominates cyclical rituals which appear to have spread with agriculture as gifts of the spirits in heaven. Possibly the Iroquois Midwinter Festival, and it is a strange palimpsest of ceremony, represents the result of the impact of an agricultural people upon a northern hunting environment. The Iroquois have both charm-bundle societies and those in which membership is indicated by dreams or hysterical possession, northern concepts, besides a regular cycle of first-fruits ceremonies closely integrated with the cultivation of maize, a peculiarly southern idea. Ceremonial buffoonery is widespread. Confession to avoid supernatural disaster occurs among the Eskimo and northern Athabaskans (Lowie, 1915, pp. 233–234). The idea of sin with fear of supernatural disaster has a greater distribution (Michelson, 1930, pp. 55–56).

(June), the fifth night of the Harvest Moon (October), and sometimes at midwinter when the medicine bundle has been used after the fall meeting to renew the strength of the medicine. They sing four periods of songs recounting the origin of the society and the cure of the good hunter by animals whom he has befriended, but the Tonawanda lodge sings a fifth group at their fall meeting. Chanters for the dead usually convene one night in March at the longhouse to rest the souls of the departed. Other medicine societies hold private meetings throughout the winter, but rarely in summer.[6]

THE TONAWANDA PATTERN

A combination of four dances, recurring together five times during the annual cycle of festivals, distinguishes Tonawanda celebrations from versions employed among the Seneca at Coldspring and Newtown, and among the Onondaga near Syracuse. Five agricultural festivals repeat the same succession of dances—Women's Dance, Feather Dance, Trotting (or Standing Quiver) Dance, Hand-in-hand Dance, and Women's Dance—with the traditional songs to the plant spirits. This ceremonial pattern, except for particular speeches belonging to each festival, prescribes the procedure for the Planting, String-bean, last night of the Green Corn, Harvest, and the seventh night of the Midwinter Festival. The Maple and Strawberry Festivals include two somewhat different patterns. Otherwise, on a given day of a longhouse festival, the arrangement of the ceremonies follows the general ceremonial pattern observed at all Seneca longhouses, which I have described in another paper (Fenton, 1936, p. 14; Morgan, 1901, vol. 1, p. 185).

The scope of this paper permits only a schematic summary of this 1 night in the cycle of ceremonies. After preliminary meetings, a collection of food and money precedes communal cooking and the festival at the longhouse. Dances to the triad of agricultural patronesses—the spirits of the corn, beans, and squash: three sisters—should commence at dusk, because "the corn grows at night" and the ceremonies are believed to assist its growth. An appointed speaker explains the significance of the meeting, returns thanks to all the spirit-forces from the earth to the Creator, particularly the growing plants and the Thunderers who water them, and announces the names of the singers and dancers. Four dances follow. The women dance first. The Feather Dance to the Creator follows. The Trotting, or Standing Quiver Dance harks back to centuries of war parties dancing about their stacked arms when breaking camp. Hand-in-hand Dance symbolizes the bean and squash vines reaching out tendrils to grasp the growing corn. The Tonawanda people call these the Four Rituals because they are invariably performed at these five festivals. However, the other Seneca refer to the Feather Dance, Thanksgiving Dance, Personal Chant, and the Bowl Game when they mention the Four Ceremonies. Lastly, the women dance about the food kettles to the accompaniment of the traditional songs of the three sisters—corn, beans, and squash—dramatizing the sisterhood of women and cultivated plants. The speaker returns thanks to the participants, invokes a blessing on the people, and announces the next festival. An equitable distribution of the feast ends the meeting, and each family takes home its share of food provided for the communal cook house. Management of the festival rests with two women, one from each moiety, and they choose a chief as their speaker.

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[6] Form and content of the series and the function of specific rites is presented in outline as an appendix.

Peculiar to Tonawanda is the performance of the Feather Dance and Thanksgiving Dance on the third and fifth days of the Midwinter Festival and the first day of the Green Corn, and the coincidence of the Bowl Game, Women's Dance, and Personal Chant on the fourth and sixth days of the Midwinter Festival and the second day of the Green Corn Festival (Fenton, 1936, p. 21; Morgan, 1901, vol. 1, pp. 196, 213). Since daily arrangement of major rituals disagrees with Morgan's statement of 1850, we must consider the possibility of change.

MORGAN'S ACCOUNT, CIRCA 1846

Lewis Henry Morgan left us a somewhat complete account of the ceremonies current at Tonawanda in the middle of the last century, but attributed them to all of the Iroquois. While his description of the Midwinter Festival is full and rich, including difficult ritual prayers, which Ely Parker had ably translated, and there is an occasional brilliant description of a social dance, like the Trotting Dance (Morgan, 1901, pp. 271–273), which could only have been done from notes taken on the spot, his work is, nevertheless, unbalanced by failure to mention other significant details. He mentions turtle rattles accompanying the Thanksgiving Dance, instead of the water drum and horn rattle (Morgan, vol. 1, pp. 192, 273). He says nothing of the almost nightly winter meetings of medicine societies. He does not complete the programs of minor festivals after the Maple Dance to demonstrate their essential similarity (Morgan, 1901, vol. 1, p. 185). His failure to make any reference to a Green Bean Festival arouses one to wonder how much he really saw, to what extent he depended on Parker, how long he was in the field, and where he did his work. His extraordinary interpreter and collaborator, Ely S. Parker, lived beyond the ford in Tonawanda Creek from Sand Hill longhouse, the probable locus of the rituals he describes. Parker had access to Handsome Lake's successor, Jimmy Johnson (Soshe'owa˙, "Great-burden-strap"), whose working knowledge of the rituals extended back beyond the advent of the prophet's teaching in 1800. Nevertheless, in mulling over the material which Parker furnished him for describing the religious system of the Iroquois, Morgan is frequently guilty of repeating Parker's failure "to describe Indian life in terms of itself," a method on which Morgan later insisted. Since Morgan was at his best when describing phenomena which he had observed and later investigated, and since some of his observations were so penetrating that no less an authority than Lowie (1933, p. 206; 1936, pp. 169–170) has dubbed him a superb observer, it is especially interesting to learn which rituals Morgan actually witnessed. Morgan's manuscript journals and field notes, in the Rush Rhees Library at the University of Rochester, disclose that all of his expeditions to the Seneca fell in the late fall and winter, by far the best season for field work among the Iroquois. Occupied with farming and hunting during the spring, summer, and fall, the Indians feel "free to talk while the earth sleeps." Nevertheless, he missed an opportunity to observe the periodic succession of first-fruits ceremonies, commencing with the Maple; he missed the migration of fish in Tonawanda Creek, planting, berrying, agriculture, the Green Bean Festival, if there were one, and summer harvest. He seems to have visited only Tonawanda and Buffalo Creek Reservations, apparently not going to Allegheny, and I find no entries of visits to Nicholson Parker, Ely's brother, at Cattaraugus. His first field trips were purposely made to gather information for embellishing the rituals of his "New Confederacy," an idea which the Indians at first greeted with mixed feelings; and it was only later, when he commenced making collections for the New York State Cabinet, that his interests became primarily scientific. His intense interest in rank, adoption, and place names gradually made room for the manufacture of moccasins and the finer detail of ceremonies (Gilchrist, 1936).[7]

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[7] Morgan commenced his study of the Iroquois in 1841 (vol. 1, No. 13). He discussed the Iroquois with E. S. Parker on September 27, 1845 (vol. 1, No. 19); and on October 1, 2, and 3, he and George Ripley of Rochester attended a Six Nations Council on Tonawanda Reservation (vol. 1, Nos. 12, 15). Jimmy Johnson, successor to Handsome Lake, recited the prophet's message on October 12 and 13, and Ely Parker sent Morgan an English Synopsis (vol. 1, No. 16), reprinted in A. C. Parker (1919, pp. 252–268). December 16, Morgan was at Onondaga (vol. 1, No. 6). The first of the year 1846 in Rochester, Morgan awaited reports from Ely Parker while the Tonawanda chiefs deliberated for 2 days the possible benefits Morgan's "New Confederacy" might achieve in their dispute with the Ogden Land Company (vol. 1, No. 3). Field notes for January 27, 1846 (vol. 1, No. 5), were made while a guest of William Parker, Ely's father, during the Midwinter Festival at Tonawanda (vol. 1, No. 5, pp. 69–73). After a short excursion to Buffalo Creek, he returned on February 6 and observed the White Dog hanging outside the Council house on Sand Hill (vol. 1, No. 5, p. 92; 1901, vol. 1, p. 202). An archelogical reconnaissance in the Genesee valley intervened before his return to Tonawanda again on March 3, 1846 (vol. 1, No. 7, p. 138).

In April and May, in fulfillment of the purposes of the "New Confederacy," Morgan carried a memorial to Washington to procure relief against the treaties of 1838 and 1842 at Buffalo Creek, when the Senecas compromised the Tonawanda Reservation (vol. 1, No. 8; Rep. Special Comm., 1889, p. 29).

The following fall, Morgan and two fellow members of the "New Confederacy" left Rochester, October 27, to attend the Harvest Festival at Tonawanda the following day; and in appreciation of the services of the "new society," they were adopted into various clans on Oct. 31, 1846. They remained in the field a week and returned to Rochester, November 7 (vol. 2, No. 1; vol. 1, Nos. 9, 10). As late as 1901, Charles T. Porter vividly recalled their visit, but gives the year as probably 1847 (Morgan, 1901, vol. 2, pp. 157–161).

Except for an excellent description of the War Dance (Morgan, 1901, vol. 1, pp. 250 ff.), which Morgan says in a footnote occurred at a Mourning Council at Tonawanda in October 1846 (ibid., pp. 251–252), although I am inclined to think he meant the previous year, and a reference to a speech by Abraham LaFort

Morgan was also a prolific letter writer. A letter from L. H. Morgan to Ely [S. Parker] (see Appendix A), which turned up on Tonawanda Reservation in February 1936, discloses that Morgan was writing an article on the religious system of the Iroquois during the winter of 1850. Finding his notes inadequate, he asks Ely to send him a description of "The Six Festivals of the Year," which he enumerates as Maple, Planting, Strawberry, Green Corn, Harvest, and New Year's, lamenting that he has only attended two of the six—the Harvest Festival and Midwinter, or New Year's, Festival.

The letter sheds light on several problems. The six festivals which Morgan enumerates in his letter are the same six which he describes in the League (1901) and which are still celebrated somewhat differently at Newtown and Coldspring longhouses. With a single exception, the Green Bean Festival, Morgan's enumeration and description is that of the present Tonawanda cycle. His journals and letter say nothing about a Bean Festival. There is the possibility which Simeon Skye first suggested to me in 1934, that . . . . . "The Tonawanda band have borrowed the Bean Festival, since Morgan's day, from the New York Onondaga, who share it with their Canadian tribesmen."[8] However, Tonawanda's oldest inhabitants—Charles Blackchief, well over eighty, and Peter Doctor, in his seventies—remember the performance of the Bean Festival as a well-integrated ritual from their earliest childhood. The process of culture change implies inevitably a progressive loss of older forms; this would mean a sloughing off of festivals, a process that Morgan had already noted in the abandonment of a Whortleberry Festival; and since the Bean Festival repeats the ceremonial pattern of Tonawanda longhouse, which recurs at the five festivals of the year associated with agriculture when returning thanks to the Creator for the germination, progressive growth and fruition of cultivated plants,

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(Onondaga) as of 1847 (ibid., p. 222), the next field data are Speeches delivered at a council of the Iroquois held at Tonawanda, October 4, 5, 6, and 7, 1848, for the purpose of raising life sachems (Gilchrist, vol. 1, No. 1; Morgan, 1901, vol. 1, p. 222). These speeches together with a transcription of Johnson's recitation of the Handsome Lake Region, translated by Ely S. Parker, form the bulk of Book 2, Chapter 3, of the League (1901, vol. 1, p. 223 ff.). This seems to be the council for which Morgan, as we shall see presently, requested a report in his letter of January 29, 1850.

In May 1849, Morgan visited Onondaga (Gilchrist, 1936, vol. 2, No. 2) and Oneida Castle (vol. 2, No. 3), recording the Sachem names for the confederate councillors.

On November 30, 1849, he was once more a guest of William Parker's Tonawanda home while studying material culture and collecting for the State Museum (Gilchrist, 1936, vol. 2, No. 4); and December 7, 1849 (ibid., vol. 2, No. 5), was Morgan's last field trip to Tonawanda prior to his letter of January 29, 1850, to Ely.

However, later in 1850, Morgan made two field trips: On October 28 to Grand River, Ontario (Gilchrist, 1936, vol. 2, No. 6), and another, December 26, to Tonawanda (ibid, vol. 2, No. 7), collecting for the State Museum, and prior to his publication of the League in 1851.

Following the appearance of his famous work on the Iroquois, Morgan did not return to Tonawanda until 1858, and then for 6 days, November 6-11, to obtain degrees of relationship (Gilchrist, 1936, vol. 2, No. 11). The last entry of possible Tonawanda source material is a record in 1865 of a Conversation with E. S. Shawano, an Ojibwa, and N. Parker, Ely's brother from Cattaraugus (ibid., vol. 6, No. 4).

[8] Fenton, 1936, p. 6; Beauchamp, 1891, p. 42; 1922, p. 189 (where Beauchamp notes Morgan's omission); Goldenweiser, 1913, p. 471.

I am inclined to believe that the Bean Festival is an old Seneca observance at Tonawanda rather than an idea which someone brought back from Onondaga and promoted within the old Tonawanda pattern.

Confession, which used to precede all festivals, and the possibility that the wampum strings which were hung about the White Dog's neck when it was burned on the fifth day of the New Year might be the confession strings, worried Morgan. In writing the League, he decided that the White Dog was not the scapegoat for the sins of the community. He was not quite sure that the festivals constitute a fixed recurring cycle, antedating the teaching of Handsome Lake. The nature of the Thunderers and the concept of a good and an evil spirit bothered Morgan. He asks about witches and the doctrine of supernatural personages; and his queries concerning the number, titles, and manner of election of longhouse ritual managers, whom he calls Keepers of the Faith, indicate a firm grasp of Seneca social structure.

Since the answers to Morgan's letter are incorporated in the first two chapters of book 2 of the League, the enigma of the Bean Festival renders Ely's letter doubly interesting.[9] First, Parker's letter reveals the degree to which Morgan depended on his Indian collaborator. Certain characteristic styles of expression in the League are not entirely Morgan's, and they appear to have crept into Morgan's writing from Ely's letters. Ely, also, at times, reflects the flowery style of his tutor: the informant bears the mark of the ethnologist. Secondly, Morgan's letter reached Ely at Ellicottville, 67 miles away from his Tonawanda people, where he was living among the whites as an Engineer for the Holland Land Co. Ely found the festivals difficult to recollect when considered apart from their natural setting. They are at best group phenomena closely integrated with village life and agriculture, celebrated by friends and relatives who share a common faith and a definite social organization which more or less prescribes the role of the individual. Lacking immediate nexus of kin and locality, Ely followed Morgan's questions. Whether or not in 1850 his people considered a Thanksgiving Festival for the green beans a definite station in the yearly cycle of ceremonies, as my oldest informants now insist, Ely omitted any reference to it and so has Morgan. Certainly, Morgan's regret of attending but two festivals, my failure to discover in his journals evidence that he ever visited Tonawanda in summer, Ely's silence, and the memory of two old men have vitiated historical reconstruction on the basis of the six festivals which Morgan enumerated, and which, from present distribution and the testimony of Old Silverheels at Cattaraugus before 1890 (Caswell, 1892, p. 215), I had believed were old Seneca festivals, asserting that the Bean Festival had diffused to Tonawanda since 1850.

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[9] Morgan methodically bound his correspondence and field notes into 8 journal volumes, containing 80 separate memoranda, which passed at his death to the University of Rochester. I am deeply indebted to Donald B. Gilchrist, Librarian of the University, who kindly helped me identify Ely's reply in the first journal volume, and then cooperated in providing a photostatic copy (Gilchrist, 1936, pp. 385–390).

Morgan appends a list of 32 dances in his League, classifying them as mixed, women's, and men's dances. Of these, 3 are sacred rites addressed to the Creator; 2 war dances are now associated with the Sun and the Thunderers, respectively, in rain-making ceremonies; 4 social dances are associated with 5 festivals devoted to propitiating food spirits; 11 of the song series belong to medicine societies whose rites are restricted to members only; and the rest are social dances. A few dances are now becoming obsolete.

CONCLUSION

The yearly cycle of ceremonies at Tonawanda longhouse fall into the general framework or pattern of all Iroquois longhouse rituals which Dr. Frank G. Speck discovered among the Cayuga. Seven festivals survive. The celebration of five festivals with the same succession of dances, the inclusion of a Bean Festival, and the sequence of the Four Great Ceremonies at the New Year and Green Corn Festivals constitute the ceremonial pattern which is peculiarly Tonawanda. Lewis Henry Morgan has left us the best published account of the Tonawanda longhouse festivals; but his limited opportunity for observation prevented his grasping the importance of the medicine societies, and it caused him to omit one of the festivals; and he had to depend on his correspondent, Ely S. Parker, who was somewhat prone to compare Indian customs with those in the Bible. And lastly, Morgan realized and discussed the essential sameness of the festivals, describing how particular speeches are repeated from time to time, and perhaps he anticipated the pattern concept, but he attributed his treatment of the Tonawanda cycle to all of the Iroquois.

APPENDIX A

L. H. MORGAN TO E. S. PARKER

ROCHESTER, *January 29, 1850.*

DR. ELY: I wish to trouble you now for a favor which will require a little of your time and patience. I am now writing an article upon the Religious System of the Iroquois and find on many points my information is not sufficiently minute. I wish you would sit down as soon as you receive this and give me a description of the proceedings at the 6 festivals of the year. 1. *The Maple Dance.* When was it instituted? How many days does it last? What is done? give me a description. 2. *Planting Worship.* When was this instituted? How many days does it last. Is it before or after planting. What does the feast consist of.—Describe the mode of proceeding and what the leading motive is. 3. *Strawberry Feast.* [See pl. 15.] Does this come before or after Planting.—What does the feast consist of. If of Strawberries how are they prepared.—What is done at this festival and how long does it generally last. describe it. 4. *Green Corn Worship.* How long does it last. Is the feast of Succotash.—Do you always have a religious discourse at these councils. or does it all consist of dances and short speeches which precede them. *Neither of these four celebrations have I ever attended.* and as I must describe each one minutely. I must look to you for a general and full explanation of them all. 5. *Harvest Corn Worship This I have attended.* Is that prayer you gave us giving thanks to the sun. & moon. & thunder & trees & birds used at this feast. or is it confined exclusively to the New Years. Give me the general idea of this festival. 6 & last the *New Years. This I understand pretty well from what I have seen & the explanations I have had from you and others.*[10] Still there are some things about it I do not comprehend. Does Each person go near the Dog and make a confession of his sins in silence? How is it about the String of Wampum. It is always put about the neck of the dog. I understand Each one talks his individual sins into this "string." after which it is hung around the dogs neck & burned with him—Explain this whole proces minutely and you will oblige me greatly. The Spirit of the dog ascends to the Great Spirit and carrys the prayers of the people. Is that the idea of sacrificing the dog? What time in the 5th day is the dog burned. at Sunrise or towards noon. Is he taken down from the pole over night or does he hang on the pole from the 1st to the 5th day. I wish you would describe the proceedings of this day methodically. I have the prayer but none of the other speeches. If you can remember them, or any part of them I wish you would write them down for me as full as you can in their order. I have been anxious for years to get this ceremony written down. I have tried this (?) repeatedly but without success. How are dreams worked off by confession—Are the same round of ceremonies. and the same speeches and dances used year after year in these 6 festivals.

Let me ask you also if these six festivals were not instituted long before Handsome Lake began to preach. These I suppose are a part of the old system. Under the old System also the Great Spirit is not regarded as the Creator of the world. This idea appears to have been introduced by Handsome Lake. The idea of future punishments also I take to be a part of the New System. and no part of the old. How do you understand it—Under the old System & new the Iroquois believed in the Great Spirit, the Evil Spirit (Send me the name of the Evil Spirit) & He is the spirit of thunder. What other Spirits or Gods did they believe in. Give me the Indian names and office of each. I find in my notes that He-no consisted of four persons. Tell me the Indian name and office of each of this also (?) I suppose one of them must be the Chief God of thunder and the others assistants.

The doctrine of Witches & supernatural personages. Will you explain it briefly—Do the Indians pretend that man ever saw the Great Spirit

One other thing I wish explained and that is the Committee or Prompters or Managers as you call them who are appointed on each reservation (?) to take charge of the dances the festivals. & religious discourses. How many are there at Tonawanda, or about how many. Do they hold their office for life? Are they appointed by the whole people or by the Tribe or by the Chiefs or by the Women. Explain the manner of their appointment. the term of their office their duties. & their numbers. I wish to understand this part of the system. What is the name in Seneca of the whole Committee as a Body & what the name of each one, includes a single committeeman—

Now if you can write me about two sheets of Cap paper at least in answering all these questions as I wish them answered. and I shall esteem it a new favor if you will take your earliest leasure. [sic] and give me full answers to all these inquiries and such other explanations and discriptions [sic] as you may think suitable.—*When you have finished your answer I wish you would then read over this letter again & see if any questions are passed over in your answer.*

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[10] Italics added.—W. N. F.

If it would not be asking too much of you at one time I would like exceedingly to have your Report of the Council which we have had so long in view.—I need it now to use.

I will send you in a few days my Report to the Legislature on the Indian fabrics which I collected at Tonawanda for the Indian Collection. It is not yet printed [11]—

Did you see the notice of the introduction by Mr. Burroughs of Orleans of my Bill for Support and Education of a limited number of Indian youths at the State Normal School (?) I wrote a memorial to the Regents of the University on the subject of opening this school to our Indian youth, and asked for an appropriation to organise (?) and support a small class (?) at the Normal School. The Governor read my memorial, and recommended it in his message. I went to Albany Jany 1. and before I left. I got a resolution passed by the Executive Committee of the Normal School approving the plan. We also got (?) up a bill appropriating $1000 a year for two years, giving each student $100. a year & 3 cents a miles for mileage—This you see will support ten scholars. The Governor approves of the bill & I think it will pass. But we cannot tell of course as yet. Nic. Newt- and Caroline [12] will go down I think if the law passes. It will take effect May 1. You must find a few at Allegany and Cattaraugus to try the experiment.

Marsh the Resident Engineer said he thought he could give you a situation in his office in the Spring. if you wished to commence again as you did at Mt. Morris.[13] You would have a fair chance to work your way up. If it would be any inducement to you let me know and I will keep watch for you, & I think you can obtain the situation if you wished it. [p. 17.]

L. H. MORGAN [14]

APPENDIX B

E. S. PARKER TO L. H. MORGAN

ELLICOTTVILLE, *Feb. 12, 1850*

DEAR SIR: Upon much reflection, and having carefully read your letter, I am free to confess that I consider myself totally unable to answer your several interrogations satisfactorily [sic] either to you or to myself. I have at many different times written to you upon the subjects concerning which you now ask further information. I do not now recollect what I have said respecting them, and in my present answer I may say many contradictory things. And I will further, at the outset, tell you that I do not profess any great knowledge upon the several subjects and questions you have sent me to answer. [Pl. 17.]

MAPLE THANKSGIVING

I will answer your letter in the order you have put your questions, First then the Maple Dance. I cannot tell you when it was instituted, and I will say now in regard to all the dances that I cannot tell when any of them were instituted. They are all among the ancient customs of the Iroquois, and are all, besides many other feasts which are now discontinued, spoken off [sic] by all the early writers, both French and English—The Maple Dance continues only one day. This is a thanksgiving festival to the Honor of the Great Spirit, that he has caused the good tree to again produce its sweets for the comfort of man. There are a variety of ceremonies & dances at this time, but the principal one is the grand religious & or thanksgiving Dance. This dance you know is always in honor & praise of the Great Spirit.[15]

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[11] Morgan, 1852, pp. 67–117. An abbreviation of this article appeared in Stryker's American Register and Magazine, vol. 4, July 1850, Trenton, N. J. (Gilchrist, 1923).

[12] Nicholson Henry Parker, Newton Parker, and Caroline Parker, Mount Pleasant, brothers and sister of Ely S. Parker, were among the first Indians educated at the New York State Normal School.

[13] Morgan here refers to Ely's early experience as a land engineer about Mount Morris in the Genesee valley. Later, after Ely learned he could not be admitted to the bar, this adventure led to his studying at Rensalaer Polytechnic Institute and to a post superintending the improvement of the western end of the Erie Canal (Parker, 1919, pp. 77, 79, 91).

[14] This signature appears in the right-hand margin of the last paragraph of the letter. (See pl. 16.)

PLANTING FESTIVAL (SEED DANCE)

2nd The Planting worship continues only one day, I believe—It is held at the most convenient season, but must & is always at or about planting time. There is no peculiarity in the feast, it consists of course of what they can get.—The leading object of this festival is twofold; first to return to the Great Spirit thanks for the return of the planting season, and second, that his blessing might rest upon the seed they should (?) & had sown to give them a plentiful crop and an abundant harvest—

STRAWBERRY FESTIVAL

3rd The Strawberry Feast, comes off of course when the strawberrys [sic] get ripe, which I believe is in June sometime, and would of course bring it after planting season or cornplanting time—They have all they can get to furnish this feast, but strawberries form the principal ingredient of the materials, and is prepared by being jammed and then sweetened with Maple Sugar,[16] so that when it is prepared it looks like jelly, & of this each partake more or less as they have the opportunity. Sometimes water is put in, if the mixture is too thick, which is also taken either in a ladle or dipper. It is when taking this that many (?) make a thanksgiving prayer & talk to the Great Spirit—They return him thanks that he has again permitted them to taste of the first fruits of the Earth.—They pray him to spare their lives to another similar season. The whole proceedings is nothing more than a thanksgiving festival. The grand religious dance forms the principal drama in the feast.[17]

GREEN CORN FESTIVAL

4th *Green Corn Worship.*—This generally lasts 3 days. The time is spent in feasting and dancing. It is opened by a religious discourse from the Grand High Priest or one of his Deputys.—They have a number of dances during the time, but the principal ones are the Grand Religious & Thanksgiving dance.—I say that this opened by a religious discourse, of course, you are not to understand that I mean a discourse like Johnsons annual,[18] but a statement of the invariable custom from time immemorial to celebrate this event with religious ceremonies, & says that it is a duty incumbent upon the people to recognize this custom & institution of the Great Spirit, who had ever required men to return thanks to him for every return & expression of his goodness—The speaker enjoins upon the people to examine themselves & see that they harbor no ill will to anyone, thus to come up to the festival with pure thoughts and right minds—.

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[15] The Thanksgiving Dance (gane'o'ǫ) is not included in the program of the present Maple Festival at Tonawanda.

[16] Now, about 5 pounds of granulated white or brown sugar is used to sweeten the "berry juice."

[17] Here again, I think Ely's memory has failed; perhaps he means Feather Dance.

[18] Ely refers here to Jimmy Johnson (Soshe'owa⊙', "Great-burden-strap"), the first priest of the Handsome Lake Revelation, who was preaching at Tonawanda when Morgan visited it (Morgan, 1901, vol. 1, pp. 223 ff).

HARVEST THANKSGIVING FESTIVAL (BREAD DANCE)

5th *The Harvest Corn Worship.*—This in its principal features is the same as the Green Corn Feast with the adoption of that speech I gave you.[19] Thanks to the sun, moon, stars, the Thunderers etc., when they dance the Go-na-o-oh dance.[20] The Grand Religious, Thanksgiving & Thunder dances are performed at this time.—This is intended only & purely as a thanksgiving festival, for the abundant harvest reaped, and the constant return of the great blessings bestowed by the Great Spirit.

NEW YEAR OR MIDWINTER FESTIVAL

6 & last the New Years Festival—1st in regard to the confessions of the people—All the confessing of sins is done publicly before the Festival commences. This custom is adhered to now & has been for a long time, and is required & enjoined by our religion that all may come to the Festival free from sin—These confessions are made also before the commencement of the green corn & Harvest festivals. At the New Years festival, I am not aware that any person approaches the dog to confess his or her sins, though I admit that many confess in silence but not near the dog intentionally. I am not aware also, though I am conscious of the opinion you entertain respecting it, that this string of wampun into which the confessions are put, is the same that is put around the dogs neck. I hardly believe it is. And whether it is or not, it will make no difference as to the object and result. Now with us the white wampum is an emblem of peace & purity.—The dog is the only & most faithful companion (the) Indian has in the hunters state. The Indians therefore consider the trusty character of the dog. & they sacrifice him as a messenger and present to the Great Spirit, & they put the wampum about his neck to show to the Great Spirit his character and intentions. My phraseology in the last sentence may be wrong. By his character, I mean, that he is only a thanksgiving offering. It does not appear, nor is it pretended, that it is a type of anything, as to the ancient Offerings and Sacrifices we read of in the Old Testament—The wampum, always put about its neck, indicate to the Great Spirit the continued adherance [sic] of the Nation to the primitive faith.—The dog is strangled upon the morning of the first day, when the wampum is put about his neck, not by any particular person, but by someone, while others put upon him ribbons and paints, & for every favor and gift so bestowed, the giver expects a blessing. It is then, when so prepared, hung upon a pole, which is also decorated with paints and ribbons. It there hangs day & night until it is taken down to be burnt; and it is burnt early in the morning, just as the day dawn begins to appear in the east.—At this time, & during the time the dog is burning a speech is made by the High Priest or one of his Deputies. The altar is only a few sticks of wood. When the Dog is thrown in, the priest throws into the fire a quantity of tobacco, at the same time giving three whoops to call the attention of the Great Spirit. He then commences his speech. Great Spirit, Maker of us all. Listen now to what we shall say (3 whoops). Lend a kind ear to the thanks of thy people—.They thank thee that thy blessings have been so plentifully bestowed upon them during the past year. (3 whoops) Great Spirit, Our words

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[19] Morgan. 1901, vol. 1, p. 192.

[20] (gane´o'ǫ). During this dance a speaker from each moiety or a single speaker interrupts the singers to intone prayers of thanksgiving to the Creator, hence Morgan called it Thanksgiving Dance. Prior to Handsome Lake, during the period of the Cherokee and the Catawba wars and earlier, it afforded an opportunity for warriors to brag of the number of scalps taken on various expeditions; but the prophet advocated substituting thanksgiving prayers for war records which after cessation of the wars only incited domestic feuds [Henan Scrogg].

continue to flow towards thee—Preserve us from all dangers. Preserve our aged men. Preserve our Mothers. Preserve our warriors. Preserve our children. Give us wisdom. (3 whoops) we burn here tobacco; may its smoke arise to thee. We have also offered another sacrifice. May its spirit arise to thee & be acceptable. (3 whoops) The wampum we send as our pledge of sincerity—(3 *whoops*) Great Spirit, Remember us. Great Spirit, Maker of us all, we have done—

This is about the substance of the speech made upon the occasion—tenor of it is the same among the Iroquois so far as I have heard. I am unable to give you a minute description of each days performance, *having never taken any notes*,[21] and can only relate from memory. The original custom of this festival was to burn two dogs. You know the clans among the Indians are divided into two classes, each styling the other "Cousins," and it was the custom & still is among the Onondagas for each Class to provide and burn a dog. They meet in separate buildings & when they are burnt the two classes meet when the dogs are carried out together and burnt together.[22]

As to dreams, I know not whether they are confessed. During the New Years festival there is a great deal of dreaming & guessing of dreams. The ceremony is simply this. A person apparently dejected advances into the room & says will some one guess my dream. Each person guesses, & when anyone guesses the person responds & feels much pleased. A present is then made to the Dreamer, & in this way presents accumulate, out of which a dance is got up from the presents. As to the many speeches that are made at this festival, I cannot send them to you. My memory is not powerful enough to recollect them, so many and diversified are they in their nature—This part of your answer will therefor remain unanswered.

I send you in this connection a thanksgiving speech published by Baron Le [sic] Hontan in his work.[23] I have frequently heard the same sentiments and I therefore have doubt but that it was used by the ancients. That portion however relating to enemies & huntsmen (?) are now omitted—"Great Spirit, Master of our lives, Great Spirit Master of all things visible and invisible. Great Spirit Master of the spirits whether good or evil—Command the good spirits to favor thy children. Command the Evil spirits to keep at a distance from them. O Great Spirit keep up the strength and courage of our warriors, that they may be able to stem the fury of our enemies. Preserve the old persons, whose bodies are not quite wasted that they may give counsel to the young. Preserve Our Children. Enlarge their number. Deliver them from Evil spirits to the end that they may prove our support and comfort. Preserve our parents and our beasts, if thou meanest that we should die of hunger. Take care of our villages, and guard our huntsmen in their hunting adventures. Deliver us from all fatal surprises when thou ceasest to vouchsafe us the light of the sun, which speaks thy grandeur and power. Acquaint us by the spirit of dreams, with that thy pleasure requires of us or prohibits us to do. When it pleases to put a period to our lives, send us to the great country of souls, where we may meet with those of our fathers, our mothers, our wives, our children, and our relatives, O, Great Spirit, Great Spirit, hear the voice of the nation. Give ear to all thy children and remember them at all times."

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[21] I have employed italics here, as in the preceding letter, for emphasis.—W. N. F.

[22] The Seneca and Onondaga clans are grouped into two phratries or moieties that perform reciprocal and complimentary ceremonial functions.

[23] Morgan, 1901, vol. 1, p. 192, says in a footnote, "For similar address in use among the Ottawas, see La Hontan's North Am., Lond. Ed. 1735, V. ii, p. 34."

THE OLD RELIGION

None of the 6 festivals were instituted by Handsome Lake, but he dedicated the Grand Religious and Thanksgiving dances particularly & peculiarly to the worship of the Great Spirit.[24]

You say that under the old system the Great Spirit is not regarded as the maker of the world. This is very true and it is further true that the new system introduced by Handsome Lake does not make him the creator of the world. It only confirms the ancient system of theology respecting him.—That He is the Maker of man and all the animals, which man can make useful to him in any way, Also that He blessed & sanctified some of the fruits of trees to the palate of man—They hold further that the Evil Spirit made all poisonous animals and put poison into some herbs and fruits of trees—The entire system consists simply in this that the Great Spirit made all that is good and beautiful, and the Evil Spirit everything that is poisonous and deformed.—Further that the Great Spirit is now the ruler of all things. He wills everything to be done that is good for man.—I do not understand that the idea of future punishments & rewards was unknown to the old system. It is said to have been/was one of its principal features. What is called the new system is only a systematic collection of their ancient notions on these subjects, and was intended only to refresh the memories of all upon their respective duties to one another as members of one great family & of their obligations to their Creator.—This I gather from the sayings of Handsome Lake himself, from the sayings of old men, who were taught before Handsome Lake preached, and from all the early writers upon Iroquois customs religion &c, who are all agreed.

The Seneca name for Evil Spirit is 1st Hā-ne-go-ate,-geh, meaning Evil minded.—2. Hā,-nis-ha-o, noh—His satanic majesty. Hā, nis-na-o-noh, geh, Hell or the place of Evil Spirits—.

THUNDERERS

I cannot give you the information you require respecting the 4 spirits of Thunder. I am not aware that they have separate names. Still they may have. The oldest spirit is chief, & they are not Gods, but deputies of the Great Spirit to rule & dispense rain, & destroy Evil Spirits. The youngest of them is said to have been the offspring of a girl who lived at Cayuga above Niagara Falls, & who at one time was lost for the term of one year, during which time she was intermarried with one of the thunderers. Their offspring was a boy, who being at one time ill treated refused to remain longer with his earthly relatives & so translated himself to the clouds & became a juvenile Thunderer—The relation the thunderers sustain to the Indian race & the designating title for them is Grand Parents.—

The Iroquois do not pretend to have any other God than the Great Spirit. But there are many spirits, who are considered only as messengers & assistants.

WITCHES

The Indian notion of witches is very vague—But they are all agreed that such a thing as a witch exists, and they believe that the witch is human, either male or female & may be either young or old. By some means or other, yet unknown to me & everybody else except witches, and hence their indefinite notions on witchcraft, a person becomes endowed with the power of doing evil, of destroying lives at their will and pleasure, by means of unseen poison—It is said that there is a regular and ancient organization of these demons, & that they have a regular initiation and fee. The fee is the life of the nearest & dearest relative or friend of the candidate, and the deed of poisoning to be executed by the candidate upon the eve of admittance. This may or may not be all true, but such is the belief. A witch, it is said, can transform themselves into kind of an animal and assume their shapes & as soon as thought regain again the human shape. They can dwindle down to a mere fox, or assume the huge dimensions of the black Bear, or they can take unto themselves wings and go to distant lands. Now whether this be so or not is altogether immaterial for our purposes, it is sufficient for us that these are their notions & beliefs.—They believe it is an organization of the Evil minded one for there is no good in them, & therefore it was a capital crime for anyone to be convicted of being a witch, and any person is justifiable in killing a witch whenever they are found on their nightly demoniac excursions.

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[24] Here, Ely refers to Grand Religious, really Great Feather ('osto'we'go·wa·"), and the so-called Thanksgiving Dance, literally skin drum head (gane'o'ǫ). Handsome Lake revised them, but they are old enough to be included in the cosmologic legends (Hewitt, 1928, p. 559 ff.)

For a treatment of the New Religion of Handsome Lake, see Morgan, 1901, vol. 1, pp. 217–248; Parker, 1913; Spier, 1935.

I am not aware that the Senecas have any belief in any supernatural personages.—

Neither has it ever been pretended that anyone ever saw the Great Spirit.

FAITHKEEPERS

Your last inquiry respecting, Committees, Managers, & Prompters, I am wholly unable to answer. All I know is that they are elective & hold during the time they adhere to the faith.—Their number is not definite or limited. Women can and must hold these offices as well as men.—They are called Ho.nun-de-unt. Literally the Keepers of the word or faith, because to them are entrusted the times of appointing extraordinary festivals & religious exercises; & upon the regular festivals they have all the responsibility upon them.—

Now Lewis I have done. This will probably be unsatisfactory, but it is the best I can do for you.—I have made out to deceive myself and write more than I expected.—But I send you the whole as it is.—The report I cannot send. It is very long & full & I have no time to copy it, & notwithstanding my promise, I do not feel disposed to copy it for anyone at present.—[25]

I am &c Yours

E. S. Parker[26]

APPENDIX C

The Tonawanda Ceremonial Cycle

A. TIME, DURATION, AND PURPOSE OF THE PERIODIC FESTIVALS

I. Midwinter, or New Year Festival: Dream Feast (Jesuits).
gană′˙ya’sǫ˙, derangement.
hodinä′˙ya’s, they are deranged (P. Dr.).[27]
gaiwanǫsgwa′’go˙wa˙’, difficult proposition, riddle (P. Dr.); the difficult ritual (HS).

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[25] Morgan has asked Ely for a copy of his report of the council, and the particular council is not clear from either letter; but Morgan's journals contain complete speeches delivered at a council at Tonawanda in October 1848, which Morgan received from Ely S. Parker in 1850 (Gilchrist, 1936, vol. 1, No. 1, pp. 1–46). This appears in the League (vol. 1, p. 223 ff.).

[26] This sheet is signed "Ely S. Parker" in the right-hand margin. (See pl. 18.)

[27] Initials stand for various informants: P. Dr., Peter Doctor, Tonawanda; HS, Hanover Spring, Tonawanda; NYSM, New York State Museum ms. by Nicholson Parker, *circa* 1850; Ch. B., Charles Blackchief, Tonawanda; HRE, Henry Red-Eye, Coldspring; and JJ, John Jimmerson, Coldspring.

yosha·se', new year (P. Dr.).
gänä'yusta', (NYSM).
Time.—Five days after the new moon of nisgowakneh (late January–February).
Duration.—Seven days.
Purpose.—Renew ceremonial associations revealed in dreams, renew old dreams, reveal new dreams; return thanks to all spirit-forces.
Feature.—Medicine Societies' celebrations (Feast of Fools); White Dog Sacrifice.

II. Maple Festival, or Sap Dance; thanks to the Maple.
gahada otoddinonio', tree thanking (NYSM).
wainontchiiskot, sap boiling (NYSM).
ę'nǫtcisgo·', sap boiling (Ch. B.).
otadinǫnyǫ·' ne· wa'hda', thanks to the Maple(Morgan, HRE, JJ).
Time.—At Maple harvest (March 30, 1935).
Duration.—One evening.
Purpose.—Thanks to the Maple, the harbinger of spring.

II *a.* Sun Shooting Ceremony: Thanks to the Sun.
deǫdi'nǫnyo·' gä'hgwa·', they thank the Sun (Ch. B.).
Time.—Occasionally in early spring (now obsolete).
Duration.—One day.
Purpose.—Dislodge frog that is retarding warm weather by engulfing the Sun; implore Sun to grow warm.
Feature.—Shooting at Sun; Feather Dance in honor of Sun.

III. Planting Festival, or Seed Dance: Soaking of the Seeds.
wainǫ'noę gwa'šo·', they-the-seeds-soak (Ch. B.).
waäno'nägwa sho·t (NYSM).
ayεnt wä tä (Morgan, 1901, p. 186).
Time.—When the dogwood is in bloom, early in May (15, 1935).
Duration.—One evening.
Purpose.—Ask the Creator to bless seeds going into the earth (Morgan); appeal to Our-Life-Sustainers, the three sisters—corn, beans, squash; appeal to Thunderers to water the growing plants.
Feature.—Morgan says (1901, p. 187) that tobacco burning invocation used in later days, but anciently only at three principal festivals: Green Corn, Harvest, New Year.

III *a.* Corn Sprouting Rite (?). "Towiissas, an annual thanksgiving ceremony led by the women, in honor of the corn, beans, and squashes" (NYSM, list of annual festivals (Seneca)). This ceremony, now part of the Green Corn Festival, was apparently performed periodically during the year by the women to stimulate their cultivated plants. It was probably associated with first and second hoeings, celebrated again at Green Corn, and finally at fall harvest. It is sometimes performed at midwinter.

IV. Berry Festival, or Strawberry Dance: Dipping the berries.
hanundä' yo (Morgan).
wainǫda'·yo·· they-berries-dip (in water) (Ch. B.).
wanondagaet (NYSM).
Time.—When strawberries ripen in June; fifth day of berry moon (oya'ikneh).
Duration.—One morning.
Purpose.—First-fruits thanksgiving; first fruit to ripen on the earth (Morgan).
Feature.—Communion with berry juice.

IV *a*. Whortleberry Festival (Morgan, 1:190).

Time.—Ripening of huckleberries, not annual (now obsolete).

Duration.—One day (?).

Purpose.—Return thanks for first fruits of the shrubs.

IV *b*. Thunder Ceremony, or Rain Dance (Morgan, 1901, vol. 1, p. 188).

Time.—In case of drought (July 10, 1936).

Duration.—One evening.

Purpose.—To invoke the Creator to send the Thunderers to water the wilted crops.

Feature.—Tobacco invocation and War Dance (Sioux Type) to the Thunderers (Morgan); confession of sins which withheld rain, Thanksgiving Dance and Personal Chant.

V. Green Bean Festival, or String Bean Dance: Boiling string beans.[28]

wainǫdet{gową′′seo′ (P. Dr.).
gową′′šo·′ (Ch. B.).

waänodetgowuhseoh (NYSM, in notes by E. S. Parker and N. Parker).

Time.—When string beans ripen (July 30, 1934; August 6, 1935).

Purpose.—Return thanks to Life-sustainers and make crops grow.

Duration.—One evening.

VI. Green Corn Festival, or Ingathering of Food.

hononde{kwe′·s (P. Dr.) they-food-collect.
kwe·k (Ch. B.)

honodekweet (NYSM).

AH-DAKE′-WÄ-O, a feast (Morgan).

Time.—When the corn is in the milk (late August-September).

Duration.—Four days, anciently (Morgan, 1901, vol. 1, p. 196); three days (1847), (Morgan); two mornings and one evening (1935, 1936).

Purpose.—Thanks to Creator and Life-supporters that the crops have matured.

VII. Harvest Festival, or Bread Dance: Boiling bread.

wainǫtä′hgo·′, they-bread-boil (Ch. B. and P. Dr.).

Do-yo-nun-neo-quä-na Deoha′ko, thanks to Our Supporters (Morgan, 1901, vol. 1; p. 197).

wanontekweet (NYSM).

Time.—Late fall after gathering and storing crops for winter.

Duration.—Four days (Morgan); one evening (1935).

Purpose.—Return thanks to the Creator, his appointed ones, and Life-sustainers for a bountiful harvest.

Feature.—Council of Faith-keepers decides to hold the Midwinter Festival following their return from fall hunt.

B. PERIODIC MEDICINE SOCIETY CURES AND RENEWALS

I. False-face Society Visits.

Time.—Early spring and late fall; also at midwinter.

Duration.—One day.

Purpose.—Drive sickness and disease from the settlements.

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[28] Lacking at Coldspring and Newtown, but present at Onondaga and the Canadian longhouses; it is mentioned in notes by E. S. Parker and Nicholson Parker in the files of the New York State Museum at Albany.

II. Little Water Medicine Company Meetings.

Time.—(1) Spring meeting, when berry moon is 5 days old (June); (2) autumn meeting, when moon of ge'ǫkneh is 5 days old (in the middle of October) (October 19, 1936); (3) midwinter meeting, when the Medicine has been used since the fall meeting.

Duration.—Throughout one night.

Purpose.—Renew strength of the Little Water Medicine; rearrange the sacred bundles.

Feature.—Fifth group of songs sung at fall meeting.

III. Chanters for the Dead, 'Ohgi'we.

Time.—Winter, about March (not regular—E. S. P. in NYSM).

Duration.—One night until midnight or all night.

Purpose.—Rest the souls of the departed, or the living who have dreamed of them.

Feature.—Carry-out-the-kettle; a clockwise dance.

C. COMPOSITION OF THE CEREMONIES

I. Midwinter Ceremony.

a. Preliminary Councils of Faithkeepers.

(1) Senior longhouse officers meet and appoint first meeting of Faithkeepers who meet at the same fireplace (Julia Peters', January 12, 1936) each year, to commence advancing the "head" (feast fund). Appoint collectors from each phratry.

(2) Hear report of collectors. Appoint day to commence Five Preliminary Longhouse Councils to meet 2 days apart until fifth day of the new moon, when the Festival begins. (January 14, 1936).

(3) Council of Faith-keepers and Commoners convenes at house nearer longhouse (Wm. Gordon's, January 16, 1936). Appoint day for Faithkeepers to sit in council opposite the Chiefs and present the "head" to the Chiefs.

(4) Chiefs meet Faith-keepers at house nearest longhouse (Sadie George's, January 19, 1936). Sit spatially divided opposite each other. Faithkeeper presents "Head" to Chiefs. Chief accepts. Chiefs instruct Faith-keepers, "Cut your firewood" (for the festival). Meet 2 days hence at noon at longhouse.

b. Chiefs call Preliminary Longhouse Councils to determine the "Uncles"—Heralds for the Festival.[29]

(1) Longhouse council when sun on meridian (January 21, 1936). Sachems ask: "Who has an old dream? Who has a new dream? Who has a white dog?" If no one replies, appoint 2 days later.

(2) Question put before the Sachems (January 23, 1936).

(3) Two days later, question put to Subchiefs.

(4) Two days later, question put to Faith-keepers and the Common people (warriors). If no one volunteers, then they appoint two heralds. Other appointments for festival.

Preliminary night.—(January 28, 1936). Night watch of the Uncles. Gunshots at midnight, two shots at 3 a. m., three shots at dawn, then one, two, and three again.

First day.—The Uncles, "the Bigheads," circuit houses announcing the Festival at 9 a. m., noon, and at dusk (January 29, 1936).

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[29] There were but four meetings in 1936; informants hinted that there were sometimes five.

Second day.—Stirring Ashes rite, Dawn Song (January 30, 1936). The Way is open for the False Faces. Medicine Society rites; dream renewals commence.

Third day.—Faith-keepers stir ashes; Dawn Song. Feather Dance. Thanksgiving Dance; "go around town" through the houses traversed by Uncles.

Fourth day.—Morning; Dawn Song (February 1, 1936). Bowl Game. Women's Dance for the Life-Supporters; make the circuit of houses. *Last day of dream derangement and fulfillment;* and on into the night.

Fifth day.—Big day at the longhouse (February 2, 1936). Morning: White Dog Sacrifice and Tobacco Offering; Personal Chant; Feather Dance; Thanksgiving Dance (gane'o'ǫ) ends at noon.

Sixth day—Peach Stone game at the longhouse (February 3, 1936). Pt. 2. Large rite of Personal Chant, terminates at noon.

Seventh day.—Nothing during the day. Dance for Life-supporters (djǫhe'hgǫ) at night at the longhouse: (1) Women's Dance; (2) Feather Dance; (3) Standing Quiver (Trotting) Dance; (4) Hand-in-hand Dance; (5) Traditional Women's Dance for the food-spirits, "Our-life-supporters."

Final dance for the False Faces and the Husk Faces on the Sunday night following the Festival at the longhouse (February 28, 1936). Thanksgiving (da'hǫ) and floor managers from each moiety: (1) Standing-quiver Dance; (2) Hand-in hand Dance; False Face rite for E. Hill, passage of Husk Faces; (3) Corn Dance; (4) Shaking-a-jug Dance; (5) Sharpening-a-stick Dance, feints at door by False Faces (incomplete).

II. Maple Thanksgiving. General Thanksgiving. Tobacco burning invocation to the Maple. Bowl game between the sexes. Social dances: (1) Pidgeon Dance; (2) Quiver Dance; (3) Hand-in-hand Dance; (4) Women's Dance; (5) Fish Dance; (6) Coon Dance; (7) Shaking-a-bush Dance, or Naked Dance; (8) Duck Dance. (Note that the Feather Dance is absent.)

III. Planting Festival. (Same as last night of Midwinter Festival.)

IV. Strawberry Festival.

Time.—One morning until noon.

Purpose.—Thanksgiving.

Feature.—Feather Dance in costume. (Intermission during which four women who have been appointed pass berry juice. Individual partaking and thanksgiving.) Feather Dance in costume (second part); distribution of Feast.

V. Green Bean Festival. (Same as seventh night of Midwinter and Planting.)

VI. Green Corn Festival. Ostensibly similar to last 3 days of the Midwinter Festival, omitting the sacrifice of the White Dog.

Duration:—Two to three days depending on whether the bowl game is finished.

VII. Thanksgiving or Harvest Festival. (Same as seventh night of Midwinter.)

D. SPECIFIC RITES AND DANCES ARRANGED IN GROUPS ACCORDING TO FUNCTION

Group I. Longhouse Celebrations.
- A. Rituals addressed to the Creator.
  - 1. Four Longhouse Rituals. *Morgan's list.*[30]
    - (1) Great Feather Dance. 1. * m. & f.
    - (2) Thanksgiving Dance (gane′o’ǫ). 2. *
    - (3) Bowl game.
    - (4) Personal Chant (adǫ′·wɛ̨’).
  - 2. Confession.
  - 3. Ashes Stirring Rite.
  - 4. Tobacco invocation over burning White Dog.
- B. Rituals addressed to the mid-Pantheon and indirectly to the Creator.
  - 1. gano′iowi·’
  - 2. Thunder Rite (adǫ′·wɛ̨’) and War-dance (wasa′·se).
  - 3. Sun Rite (occasionally War Dance, wasa′·se· eni′’dje’).
- C. Rituals addressed to earth-bound spirits.
  - 1. At Tonawanda, the following "Four Ceremonies" are addressed to "the-sisters-our-life-sustainers"—the spirits of the corn, beans, and squashes, the tutelaries of agriculture:
    - (1) Feather Dance. 1. m. & f.
    - (2) ga’da′šot, Standing-Quiver, or Trotting Dance. 4. m. & f.
    - (3) Hand-in-hand Dance, symbolic of bean vines climbing corn. 3. m. & f.
    - (4) Traditional Women's Dance, the dance of the three sisters 16. f.

The appeal of these rites extends through B to A.

Group II. Medicine Society Rites, restricted to members, and addressed to spirit-forces on earth or above it.

1. Bear Dance.	24.	m. (& f. now)
2. Buffalo Dance.	23.	m. (& f. now)
3. Eagle Dance.	27.	m.
4. False-face.	30.	m. (& some rites f.)
5. Husk Faces.	31.	m.
6. The Little Water Medicine Company and yei’do·s.		
7. Otter.		
8. Changing Ribs and Quavering.	17 & 19.	f.
9. Dark Dance and Charm Holders.	21.	f.
10. Chanters for the Dead.	15.	f.
11. Carry out the Kettle.	7.	m. & f.
12. Four-nights ceremony (from Cayuga-Tutelo) is celebrated by several families.		

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[30] The numbers at the right of the page indicate the place in Morgan's list of dances; * stands for costumed rites; "m. & f." for men and women participants.

Group III. Social Dances.

1.	Standing Quiver, or Trotting Dance.	4.	m. & f.
2.	Hand-in-hand Dance.	3.	m. & f.
3.	Women's Dance, with ancient or modern songs.	16.	f.
4.	Fish Dance.	8.[31]	m. & f.
5.	Coon Dance.		m. & f.
6.	Dove, or Pigeon Dance.	12.	m. & f.
7.	Corn Dance.		
8.	Duck Dance.	11.[30]	m. & f.
9.	Chicken Dance.		m. & f.
10.	Naked, or Shaking-a-bush Dance.	9.	m. & f.
11.	Skin-beating Dance (Delaware).		m. & f.
12.	Sharpening-a-stick Dance.		m. & f.
13.	Robin Dance.		m. & f.
14.	Shaking-a-jug Dance (from Cattaraugus).		m. & f.
15.	Garter Dance (from Cattaraugus but known).		m. & f.
16.	Ancient, or Devil Dance (dji'haya') (obsolete).	6.	m. & f.
17.	Grinding-an-arrow Dance (obsolete).		
18.	Grinding-dishes Dance (employ wood rasp on a bench for resonator). (Morgan marked this obsolete.)	13.	m. & f.
19.	North Dance, or Cold Dance (obsolete).	5.	m. & f.
20.	Knee-rattle Dance (still known).	14.	m. & f.
21.	Arm-shaking Dance (Morgan marked this obsolete. It is still performed by women).[32]	29.	m.

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[31] Morgan lists this as foreign in provenience, but it has long been an integral part of the dance programs.

[32] The rest of the items on Morgan's list were not identified by my informants. Evidently some dances have appeared since his time, and some others have become obsolete. There is also a possibility that his terms are but synonyms in faulty phonetics for dances now known by other names so that my informants do not recognize them.

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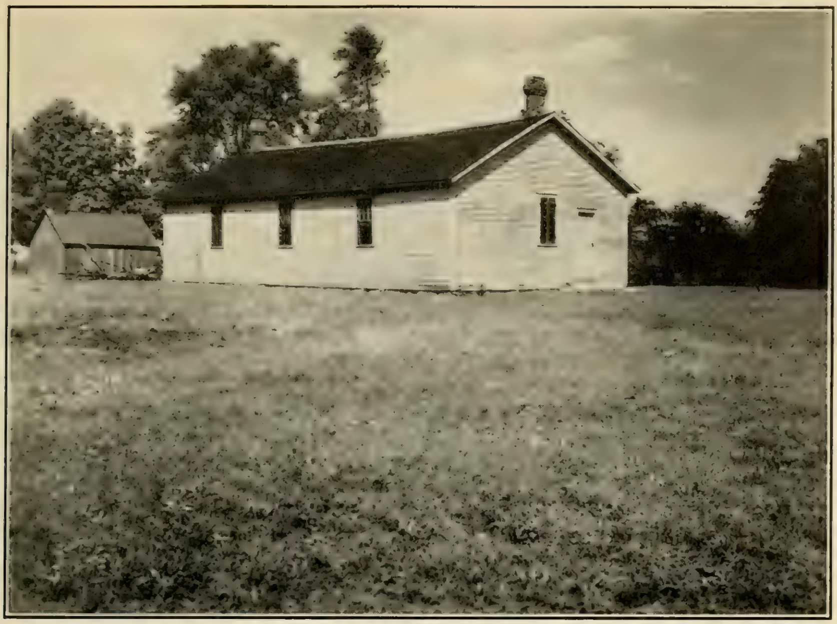
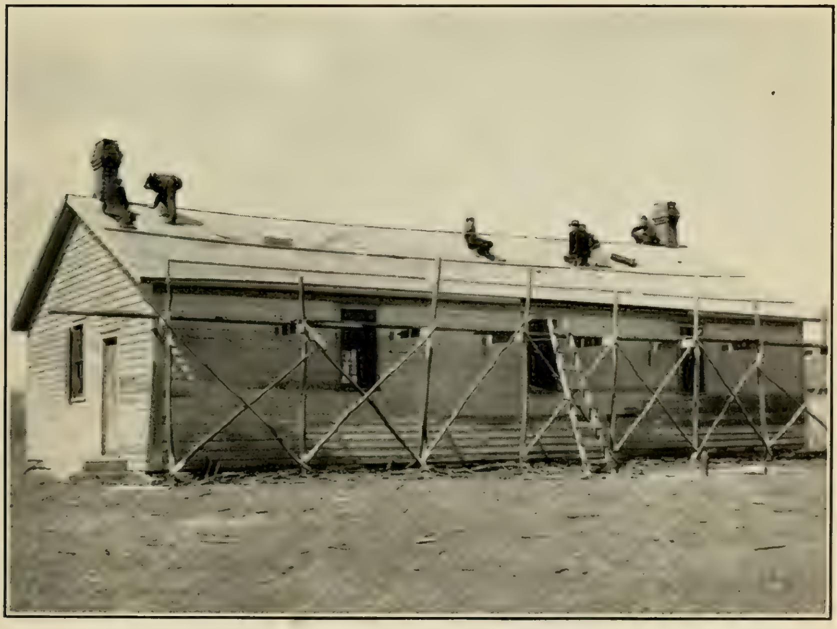
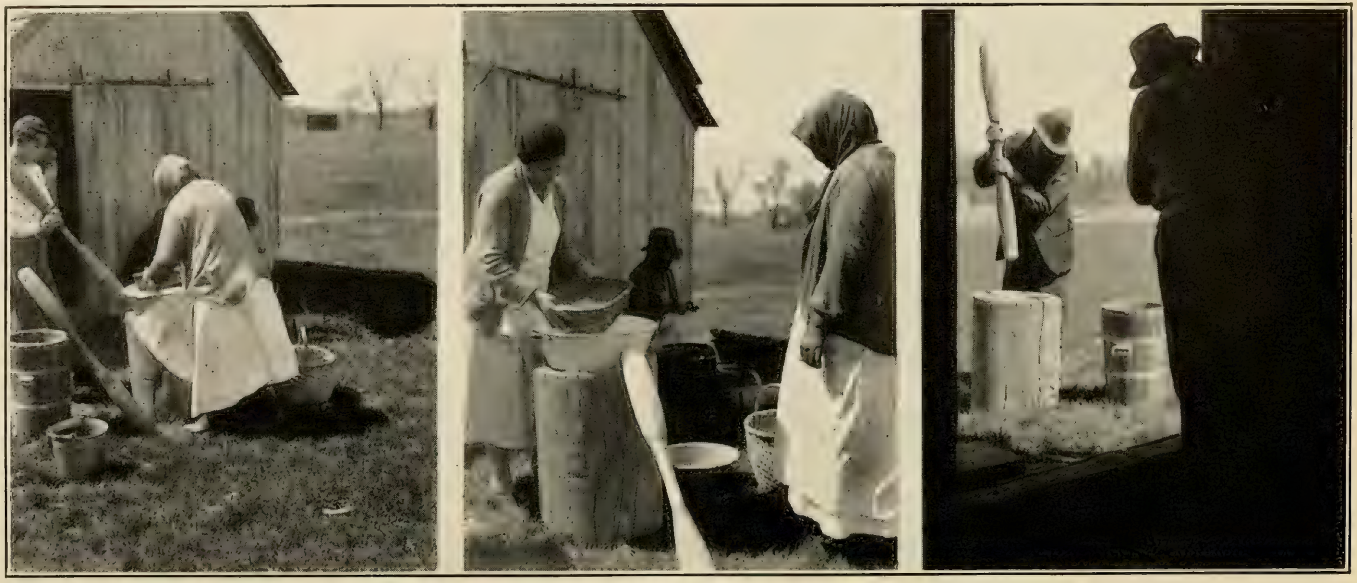


1. The longhouse and cookhouse.

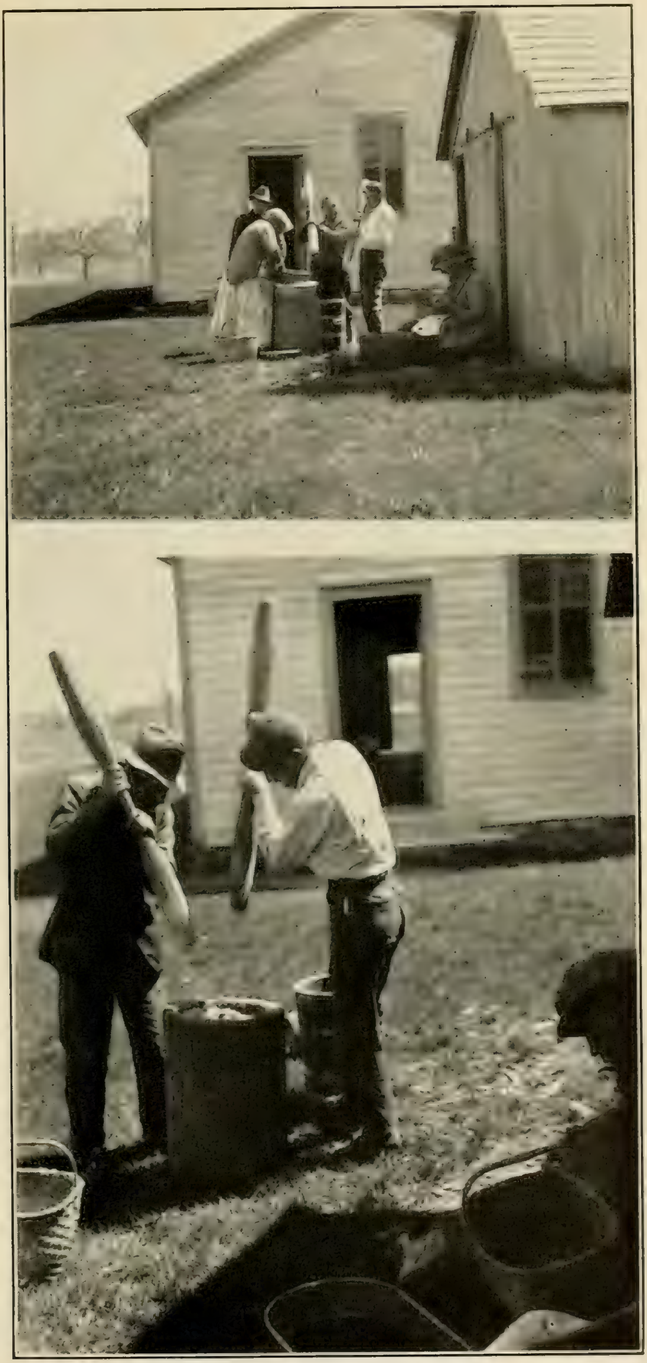


2. Indian youths reshingle the longhouse under National Youth Administration.

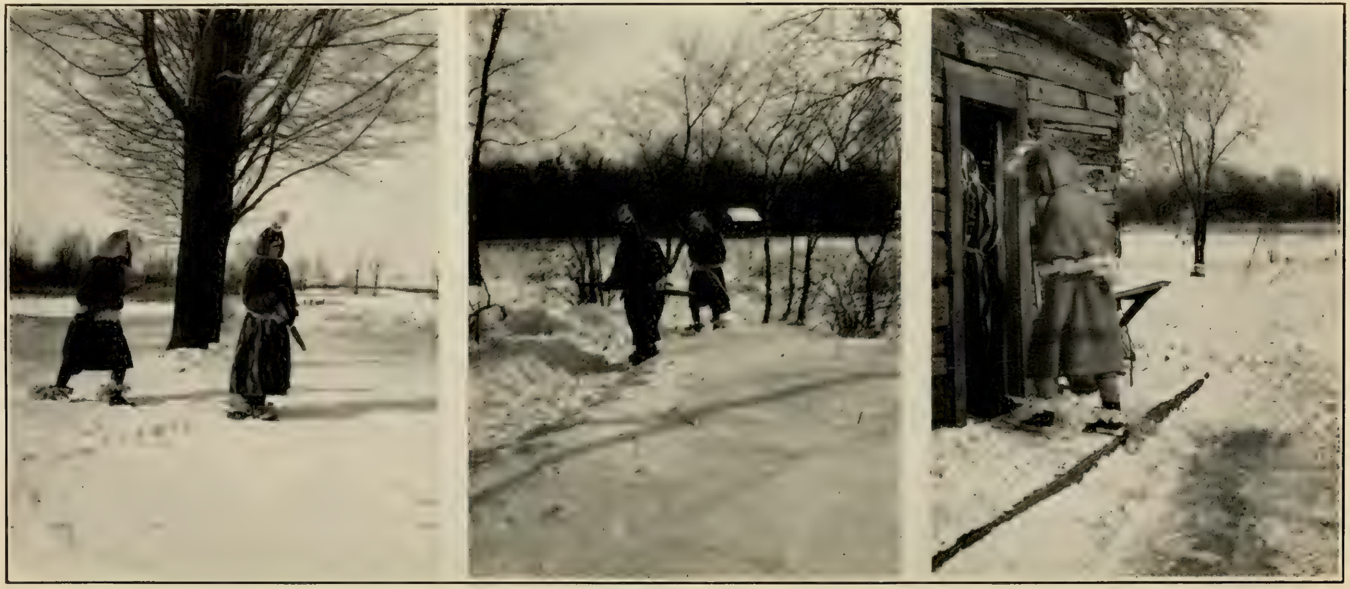
TONAWANDA LONGHOUSE.



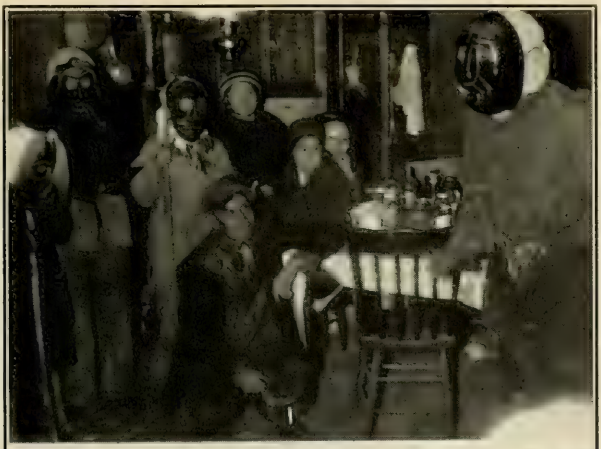
Faithkeepers Prepare the Community Feast in Honor of the "Three Sisters" at the Planting, or Seed Festival

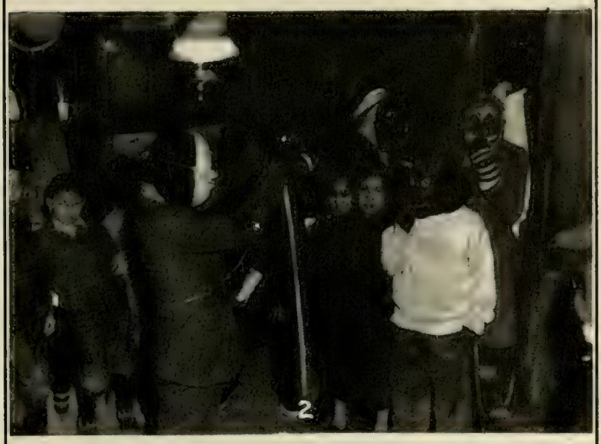


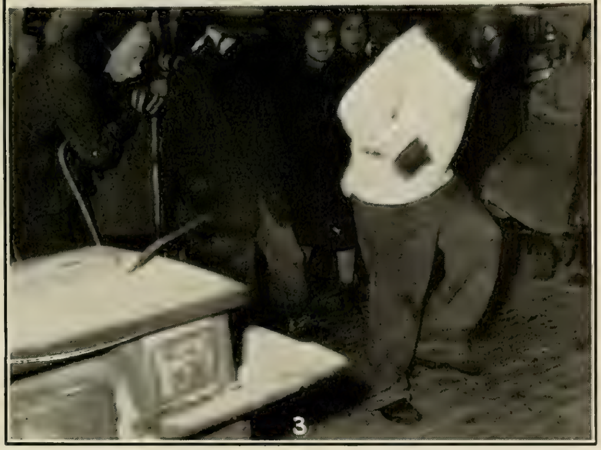
THE MEN ASSIST THE WOMEN BY POUNDING CORN.



OUR UNCLES, THE BIGHEADS, GO THROUGH THE HOUSES, ANNOUNCING THE MIDWINTER FESTIVAL

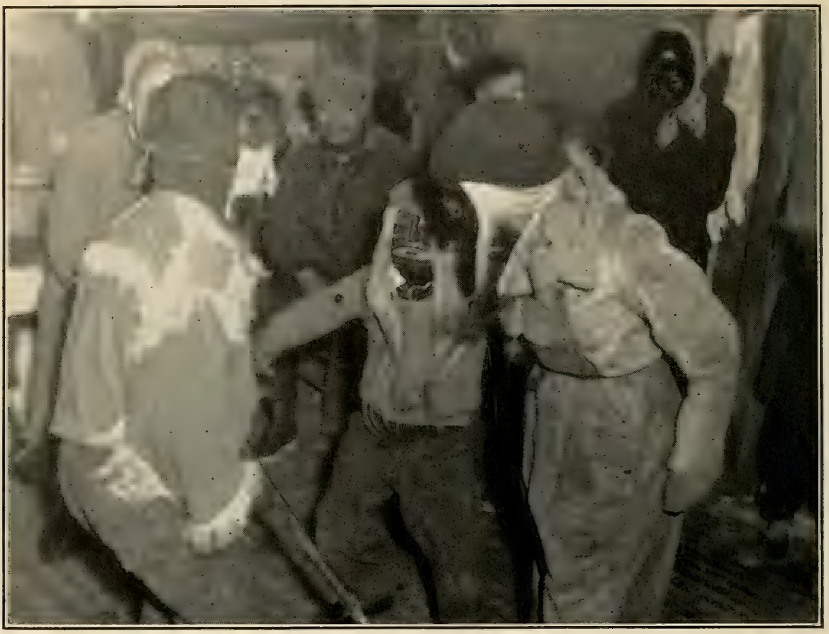


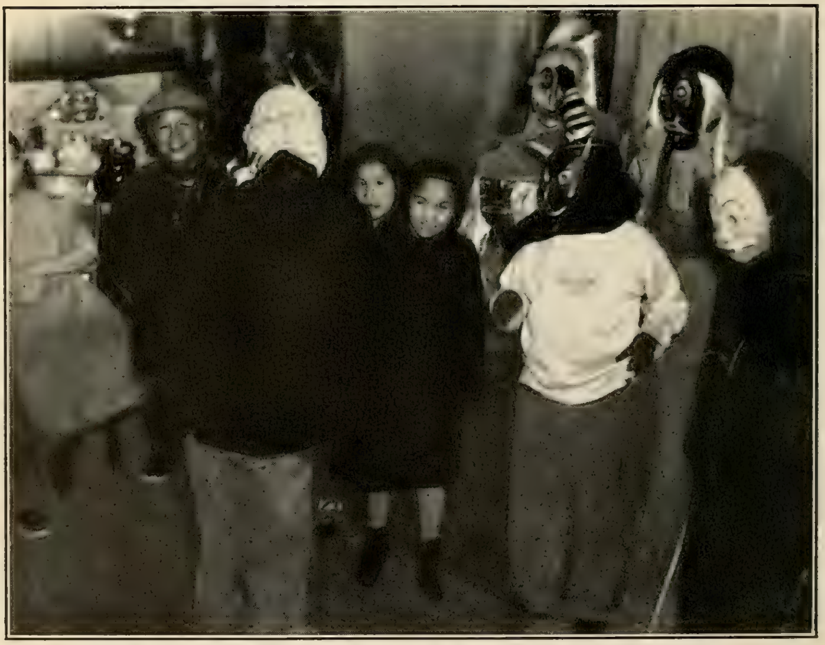




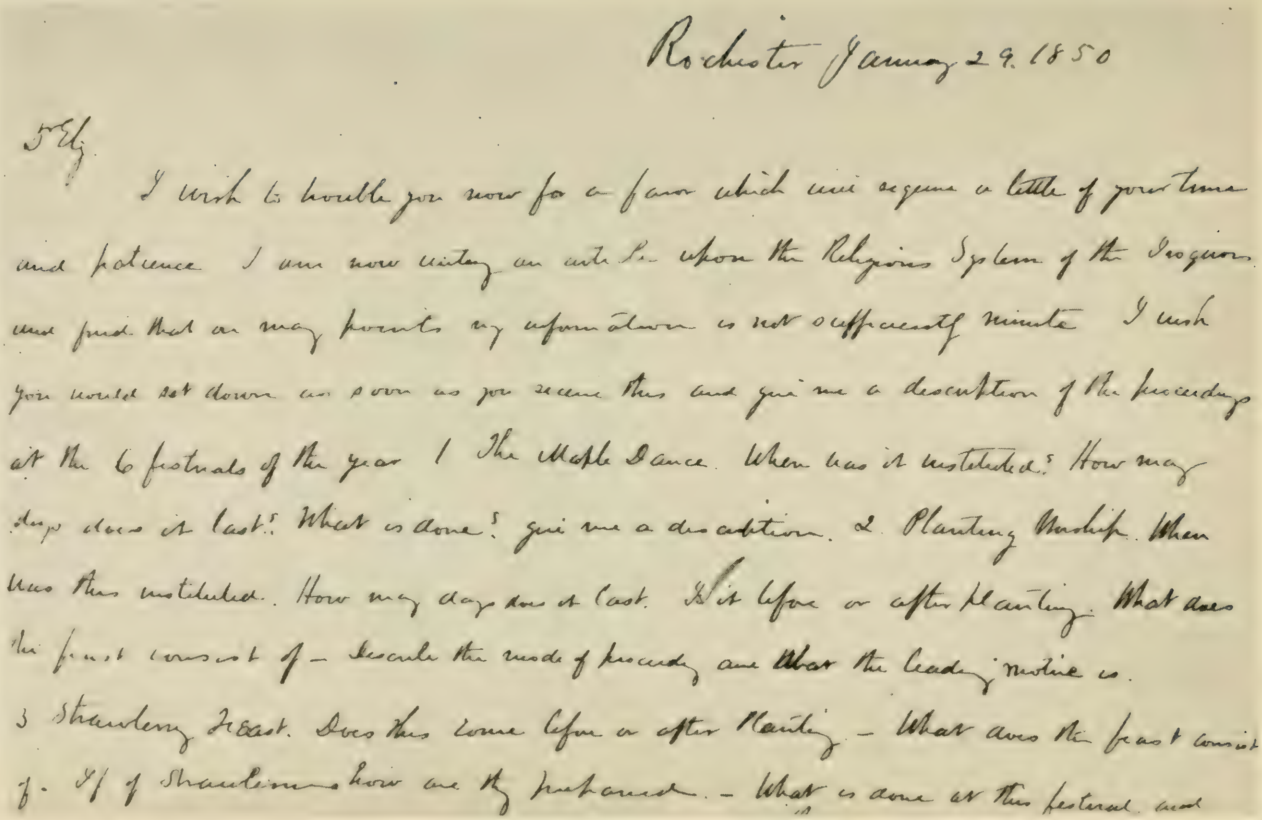
1. THE FALSE-FACE BEGGAR DANCERS VISIT A HOUSE ON SECOND NIGHT OF MID-WINTER FESTIVAL.

2, 3. CHARLIE CHAPLIN AND THE DEVIL CAPTURE THE IMAGINATION OF THE CHILDREN.





Groups and Individuals Stage Impromptu Dance Contests.



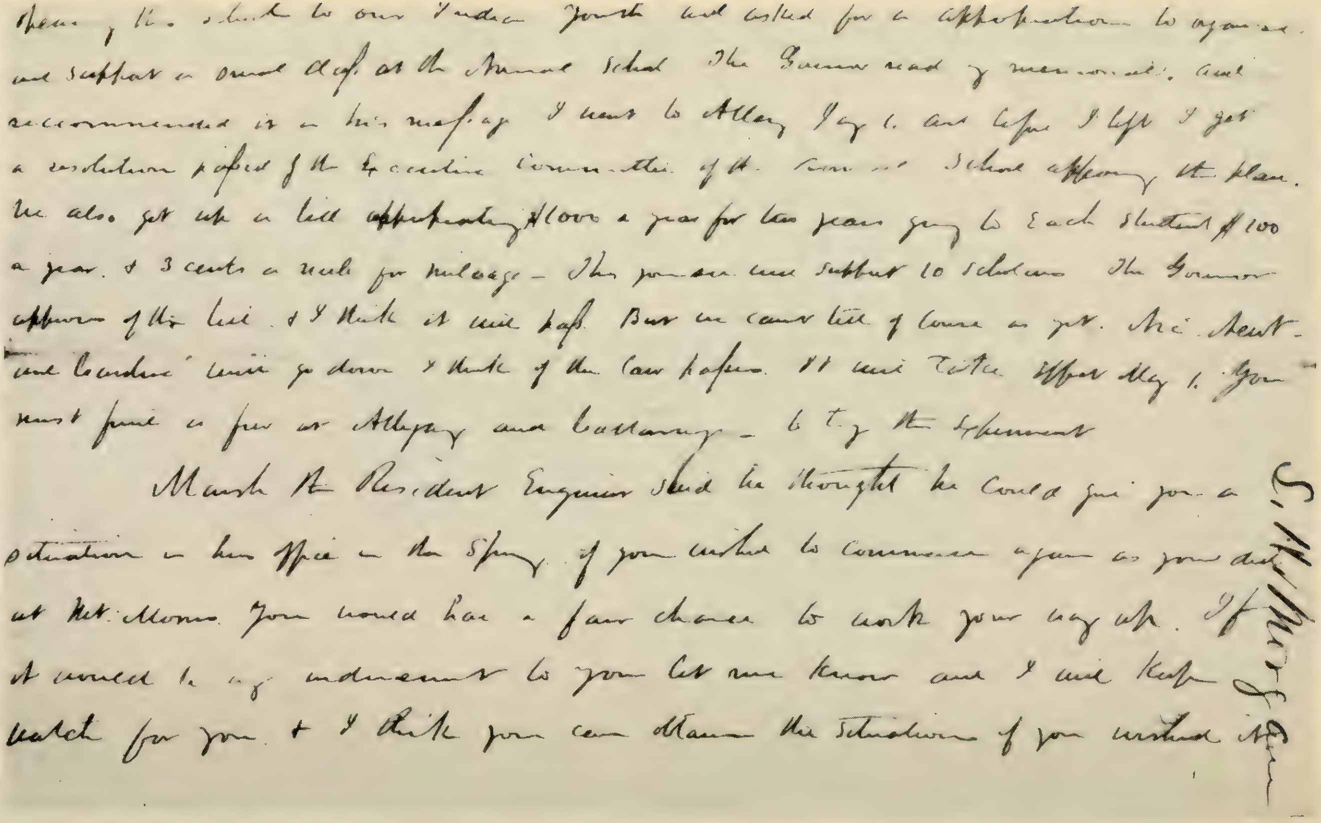
Rochester January 29. 1850

Ely:

I wish to trouble you now for a favor which will require a little of your time and patience. I am now writing an article upon the Religious System of the Iroquois and find that in many points my information is not sufficiently minute. I wish you would sit down as soon as you receive this and give me a description of the proceedings at the 6 festivals of the year 1 The Maple Dance. When was it instituted? How many days does it last? What is done? give me a description. 2. Planting Worship. When was this instituted. How many days does it last. Is it before or after planting. What does the first consist of — describe the mode of proceeding and what the leading motive is.

3 Strawberry Feast. Does this come before or after Planting — What does the feast consist of. If of Strawberries how are they prepared. — What is done at this festival and

FACSIMILE OF FIRST PAGE OF LETTER FROM L. H. MORGAN TO E. S. PARKER WRITTEN AT ROCHESTER, JANUARY 29, 1850.

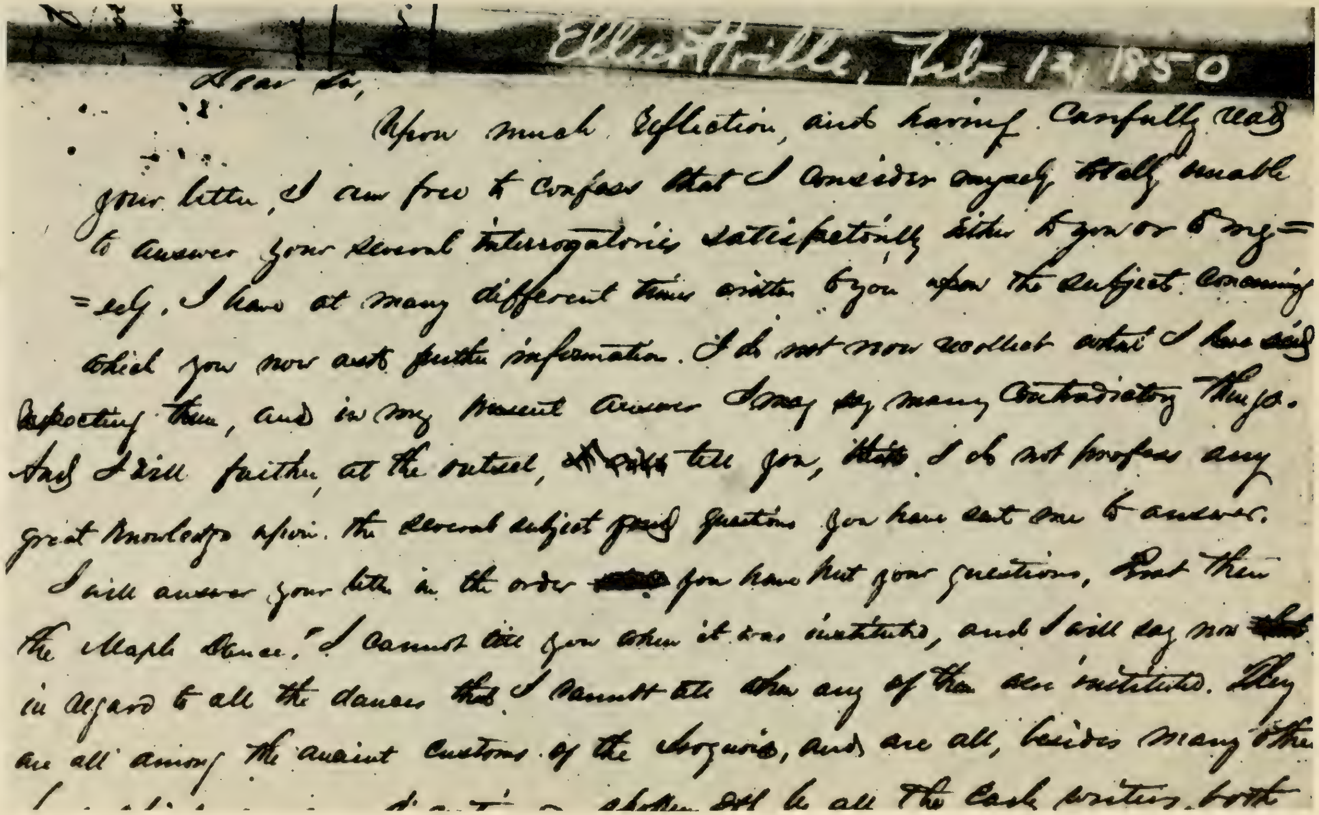


opening of this school to our Indian youth and asked for an appropriation to organize and support a Normal Dept. at the Normal School The Governor read my memorial, and recommended it in his message I went to Albany Jany 1. and before I left I got a resolution passed of the Executive Committee of the Normal School approving the plan. We also got up a bill appropriating $1000 a year for ten years giving to each student $100 a year. & 3 cents a mile for mileage — This you see will support 10 scholars The Governor approves of the bill. & I think it will pass. But we cannot tell of course as yet. Mr. [illegible] will go down & think of the law papers. It will take effect May 1. You must find a few at Allegany and Cattaraugus — to try the experiment

Marsh the Resident Engineer said he thought he could give you a situation in his office in the Spring if you wished to commence again as you did at Mt. Morris. You would have a fair chance to work your way up. If it would be any inducement to you let me know and I will keep watch for you. & I think you can obtain the situation if you wished it.

L. H. Morgan

Facsimile of Last Page of Letter From L. H. Morgan to E. S. Parker Written at Rochester, January 29, 1850, Showing Signature.



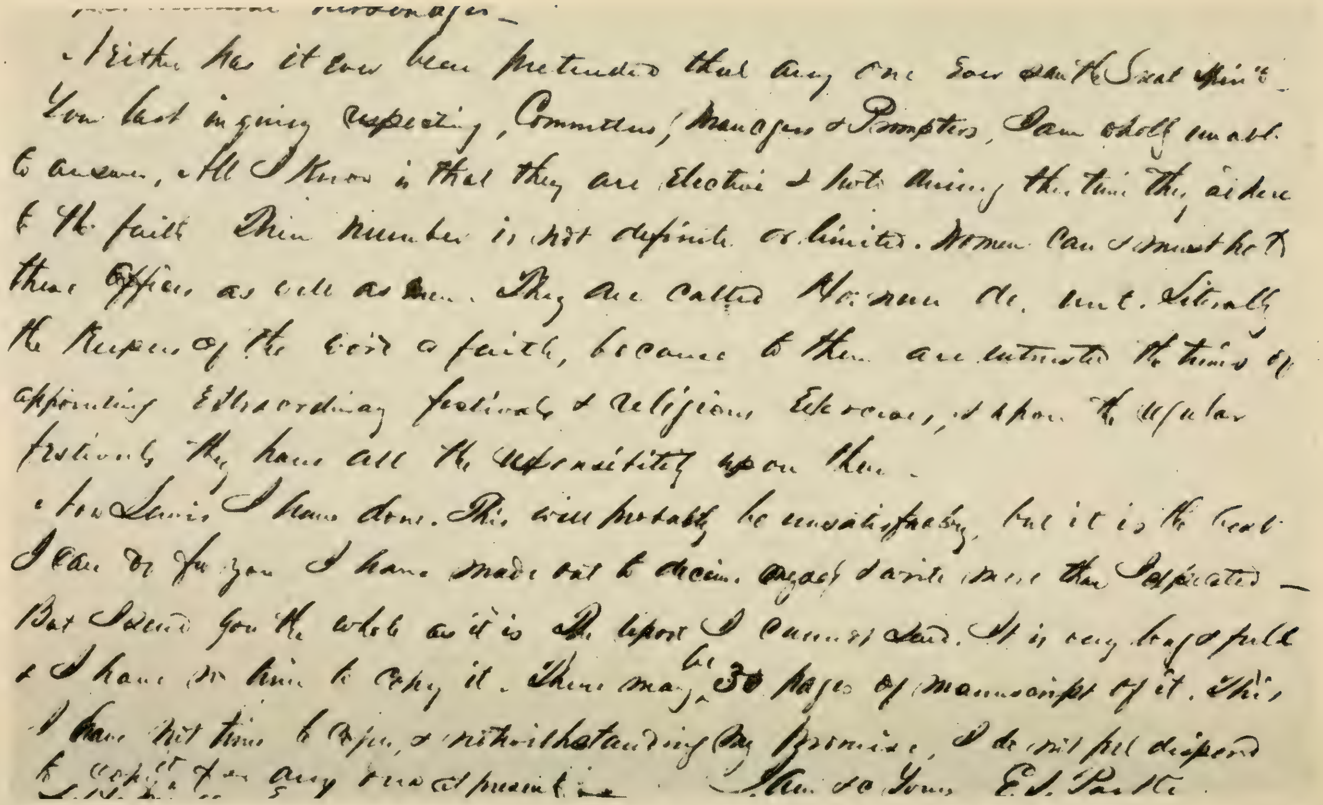
Ellicottville, Feb 12, 1850

Dear Sir,

Upon much reflection, and having carefully read your letter, I am free to confess that I consider myself totally unable to answer your several interrogatories satisfactorily either to you or to my=self. I have at many different times written to you upon the subject concerning which you now ask further information. I do not now recollect what I have said respecting them, and in my present answer I may say many contradictory things. And I will further, at the outset, ~~must~~ tell you, ~~that~~ I do not profess any great knowledge upon the several subject ~~[illegible]~~ questions you have sent me to answer.

I will answer your letter in the order [illegible] you have put your questions, first then the Maple Dance." I cannot tell you when it was instituted, and I will say now ~~that~~ in regard to all the dances that I cannot tell when any of them were instituted. They are all among the ancient customs of the Iroquois, and are all, besides many other [illegible] spoken will be all the Early writers, both

Facsimile of First Page of Letter From E. S. Parker to L. H. Morgan Written at Ellicottville, February 12, 1850



personages —

Neither has it ever been pretended that any one saw the Great Spirit.

Your last inquiry respecting, Committees, Managers & Prompters, I am wholly unable to answer. All I know is that they are elective & hold during the time they adhere to the faith. Their number is not definite or limited. Women can & must be to these offices as well as men. They are called Ho-non-de-ont. Literally the keepers of the word & faith, because to them are entrusted the times of appointing extraordinary festivals & religious exercises, & upon the regular festivals they have all the responsibility upon them.

Now Lewis I have done. This will probably be unsatisfactory, but it is the best I can do for you. I have made out to decipher nearly double more than I expected — But I send you the whole as it is. The report I cannot send. It is very large & full & I have no time to copy it. There may be 30 pages of manuscript of it. This I have not time to copy, & notwithstanding my promise, I do not feel disposed to copy it for any one at present.

Ever so Yours E. S. Parker

FACSIMILE OF LAST PAGE OF LETTER FROM E. S. PARKER TO L. H. MORGAN WRITTEN AT ELLICOTTVILLE, FEBRUARY 12, 1850, SHOWING SIGNATURE.

SMITHSONIAN INSTITUTION
Bureau of American Ethnology
Bulletin No. 128

Anthropological Papers, No. 16

The Quichua-Speaking Indians of the Province of Imbabura (Ecuador) and Their Anthropometric Relations With the Living Populations of the Andean Area

By JOHN GILLIN

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THE QUICHUA-SPEAKING INDIANS OF THE PROVINCE OF IMBABURA (ECUADOR) AND THEIR ANTHROPOMETRIC RELATIONS WITH THE LIVING POPULATIONS OF THE ANDEAN REGION

By John Gillin

INTRODUCTION

The writer and his wife visited the Province of Imbabura in November 1934, on behalf of the Peabody Museum of Harvard University. A superficial survey of the culture was made, but the primary object of this visit was to obtain a series of anthropometric measurements and physical observations for the Indians of this region, which represents the last conquest of the Incas toward the north.

Measuring and observing were done at Otavalo, near the southern limit of the Province; San Roqué, lying on the western slope of Mount Imbabura about 7 miles northeast of Otavalo; Agato, a community of free Indians about 6 miles south of Otavalo situated on the saddle which separates the basin of Otavalo from that of Lago de San Pablo; and Angachagua, a community of free Indians living in a closed valley at the foot of the Eastern Cordillera about 15 miles southeast of the city of Ibarra. The Indians of the first three localities—Otavalo, San Roqué, and Agato—consider themselves more or less related and, consequently, in the discussion of their anthropometry will be treated as one group in distinction to those of Angachagua. According to available information, both verbal and published, these localities have been least subject to acculturation and least exposed to possible admixture with other stocks (Garces, 1932; Saenz, 1933, pp. 30 ff.). All individuals who admitted Negro or white ancestors or relatives, or for whom such were suggested by our informants, were eliminated from our series after measurement. Only seven such doubtful subjects appeared. Furthermore, adult males only were selected, cripples and other deformed persons being eliminated. Such deformities included two acromegalic giants. Otherwise no selection was practised.

A total of 134 individuals was measured and observed, including 108 from Otavalo and associated localities, and 26 from Angachagua.

The writer is indebted in the following quarters and hereby wishes, even if inadequately, to express his gratitude to Prof. E. A. Hooton of Harvard University, who advised and counselled him in all phases of this work and who placed the facilities of the Harvard Anthropometric Laboratory at his disposal; the Peabody Museum of Harvard University, which financed the expedition, and Mr. Donald Scott, Director; the Government of Ecuador and particularly Dr. Louis Alfonso Merlo, formerly Governor of the Province of Imbabura, who extended the expedition many favors which facilitated its efforts; Mr. Matthew W. Stirling, Chief of the Bureau of American Ethnology, who has undertaken the supervision of the publication of this paper by the Bureau over which he presides; and the writer's wife who contributed not only her presence but also her energy as recorder and assistant.

It is now proposed (1) to tell something of the present mode of life of the Indians; (2) to review pertinent facts from the prehistory of the region in an effort to establish the antecedents of the population under discussion; (3) to present and analyze the results of the anthropological work; (4) to compare these results with apposite series from outside the area; and (5) to present such conclusions as may result from the facts.

PRESENT MODE OF LIFE

Each community of Indians in the district is an ethnic group which possesses certain details of culture distinguishing it from other villages. For instance, the form of the large saucer-shaped felt hats worn by both men and women is a common feature of village identification (Garces, 1932; Saenz, 1933, pp. 30 ff.). Except for such minor distinctions, however, the culture of the region is essentially of one pattern.

The Indians are divided into two categories as regards social and economic position in the eyes of the law: (1) Those who own the plots of ground which they work and who are called "free" Indians; (2) those who live as tenant farmers on the lands of an hacienda, obtaining the use of a plot of ground in exchange for a specified number of days' work each week on the lands of the patrón. The modes of life of these two types are not essentially dissimiliar except that the free Indians tend to be much more independent in their political and economic activities.

Maize, barley, wheat, quinoa, potatoes, lentils, and beans are the principal vegetable crops, although many others are occasionally grown. The fields are cultivated by hand with wooden spades and sometimes with iron hoes. Mutton, guinea pigs, and, occasionally, wild rabbits contribute to the meat diet. Practically all of the fields, which are seldom larger than an acre, are irrigated with water which is brought from the mountain streams in ditches constructed by the community as a whole. Domestic animals consist of sheep, goats, guinea pigs (which are usually kept in the houses), dogs, chickens, and, more rarely, asses and horses.

The latter are not plentiful among the Indians and are generally used for carrying loads rather than persons. The majority of persons depend upon the strength of their own backs for the transportation of goods.

The houses are built of wattle covered with mud, giving an external appearance of adobe construction and have gabled or four-sided pitched roofs with ridge poles. They are thatched with páramo grass. Each house is, as a rule, occupied by one family. The dwellings are usually grouped into communities, but they are not situated closely together because each is surrounded by its fields. Associated with the house is usually a kitchen, built on somewhat the same plan, while two or three houses share a large free-standing oven made of clay. In the center of each community is a plaza where is situated the church and the office of the alcade (appointed by the government and usually a literate Indian), and from this center the houses of the community spread out over the cultivated lands to a radius of a mile or two. Beyond the cultivated lands, on the slopes of the nearby mountains, are the community grazing grounds.

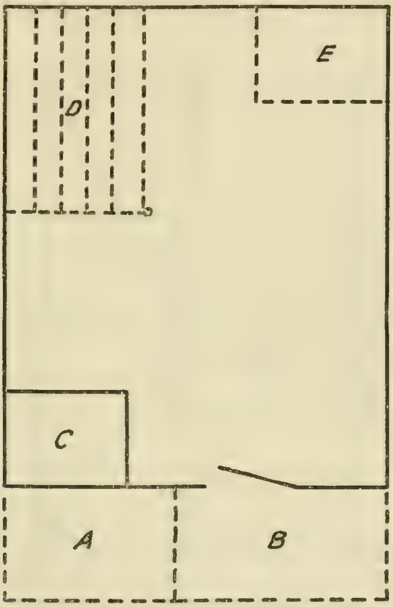

FIGURE 1.—Angachagua house plan.

A, Wood storeroom; *B*, open porch; *C*, wooden bed covered with mat of twilled leaves; *D*, loft for storage; *E*, rack for storing bags of wool and baskets.

Figure 1 is a diagram indicating the plan of a typical house and the uses to which the various parts are put. Figure 2 shows the construction of the roof frame. A group of four or five houses usually shares a watering hole and laundering place at one of the neighboring streams. In plates 19 to 21 are shown views of the houses and their furnishings. Physical types of the Indians of the Otovalo group and of Agato are shown in plates 22 to 29.

Clothes are woven at home from home-spun and home-woven wool and cotton. The costume of both men and women includes the large, platter-shaped felt hats which are made by specialists. Women wear blouses embroidered with colors, full colored skirts, bright sashes, and woolen shawls, as well as brass and silver rings and many strings of gold or brass beads around the neck. Men wear loin cloths, shirts, pantaloons reaching to the calf, and ponchos. The clothing of both sexes is highly colorful and minor details of pattern differ according to the locality. Green dyes are made by mixing quillo and alpapoca plant juices. Most of the other colors are bought at the weekly markets, which move on a circuit and form the most important institution for the exchange of goods.

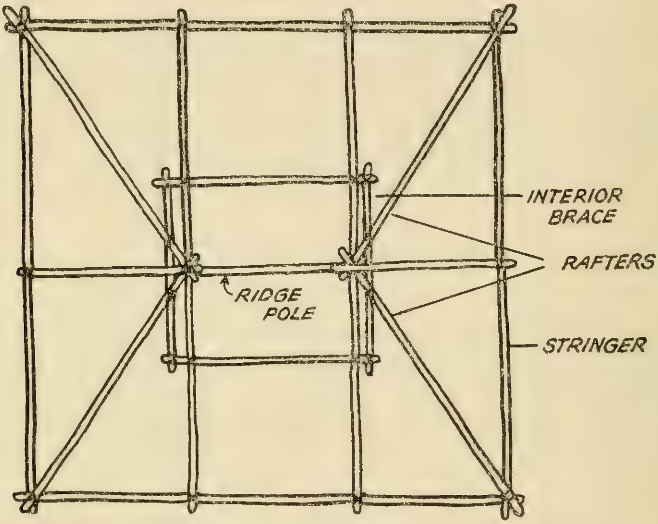

Figure 2.—Angachagua roof frame.

All the people are nominally Catholics, although many survivals of ancient superstition remain. The aboriginal social organization seems to be submerged almost entirely.

The language is a dialect of Quichua which is said to differ somewhat from that of Quito. In fact, the Angachagua dialect is in some respects different from that of Otavalo. The Quichua of the region contains a good many more or less modified Spanish words, but few

Indians are able to speak Spanish as such at all, and it is very unusual to find one who can speak it either fluently or grammatically.

As Jijón says (1920, p. 103), the people are living in much the same condition as they probably were at the arrival of the Spaniards, except for the introduction of iron, certain domestic animals and their products, the Catholic religion, and European political control. Of these it seems that the latter has had the most profound influence, because the political and economic life has been much more seriously disrupted than the material culture.

SOME ASPECTS OF THE PREHISTORY OF THE PROVINCE OF IMBABURA

Before considering the anthropometric work it seems necessary to consider what is known concerning the history and prehistory of the region, since, to a certain extent, the significance of our findings depends upon the proper identification of the people we are studying.

The people speak Quichua—are they predominately of Incaic or Peruvian blood; or, if not, what elements may have gone into their physical make-up? To shed some light on this question a survey of the literature has been made and the evidence will be summarized under the following heads: (1) Historical-traditional, (2) archeological, (3) linguistic. The physical evidence will be deferred to the fourth section after presenting the results of our own anthropometric investigation.

The present Province of Imbabura had been conquered by the Inca Huayna Capac some 70 years previous to the arrival of the Spaniards (Reyes, 1934, p. 26) and the traditions of the previous sovereigns were extant in the time of the chroniclers who followed the European invaders. Before the coming of the Incas, therefore, this region, according to Velasco (1841–44, vol. 2, pp. 4 ff.), was occupied by the tribe of the Caras. They lived in the interandine valley in what is now the major part of the Province of Imbabura. Their territory was bounded on the north by the Rio Chota, which separated them from the Tucano-speaking Pastos. On the west beyond the cordillera, lived the Barbacoas, and east of the region on the Amazonian side of the mountains, were the Cofanes and the Quijos. The Cara had extended their dominion over the Canaris probably south of Riobamba (Velasco, 1841–44, vol. 2, p. 6), although Rivet regards 0′31″ south as the southern limit of their effectual distribution, because of the absence of place names with the Cara ending, *-pi*, beyond this parallel. We are told that the *tola* burial mounds, associated with the Cara culture, are not found south of the Rio Guallabamba (Verneau and Rivet, 1912 and 1922, vol. 6, p. 15), and Cieza de León (1853, p. 392) reports that south of this river a different language was spoken in the villages of Panzaleo and Machachi. There is thus some disagreement as to how far south the Cara occupation extended, but all reports point to the fact that they did occupy the Province of Imbabura.

In 1582 the villages inhabited by Indians in the region of Otavalo were enumerated by the local Spanish administrator who gave the Indian population of his district, which is roughly the southern two-thirds of the present Province of Imbabura, as 11,252 souls (Ponce de Léon, 1881–97, vol. 3, p. 111).

According to Velasco (1841–44, vol. 2, pp. 2–9), the Caras were invaders who arrived in Manabí on the Pacific coast of Ecuador on large rafts, coming from the west. They first occupied the region between the Bay of Charapotó and the Cape of San Francisco, and founded a village, or town, named Caraques. They later migrated along the coast toward the north, because increase of population and dissatisfaction with the tropical climate demanded territorial expansion. They discovered the mouth of the Rio Esmeraldas and an easy way into the interior by ascending the river.

About A. D. 980 the Caras found themselves far up the Rio Blanco, a tributary of the Esmeraldas, on the slopes of Mount Pichincha (Means, 1931, p. 147). After establishing themselves in the Otavalo region, they moved south under the leadership of the Scyri (meaning chief, or king) and conquered the so-called Kingdom of Quitu, which was apparently a loose confederation of rather low-cultured tribes or groups established very anciently in the region surrounding the present city of Quito.

The earliest conquests of the Caras, according to Velasco, lay north of Quito and included Cayambe, Otavalo, and Tusa (modern San Gabriel). The seventh Scyri extended the conquests south of Quito, conquering the present Province of Latacunga with little difficulty. Attempts to subdue the warlike tribe of Puruha, whose capital was Riobamba, were unsuccessful and finally a friendly alliance was made with this power. The eleventh Scyri, however, managed to arrange a marriage between his only child, a daughter named Toa, and the heir of the Puruha line, named Duchicela. Thus the Caras came into possession of the Puruha territory by marriage about the year 1300, continuing a peaceful expansion by making alliances with the Cañar and other tribes farther to the south in order to resist the expanding power of the Incas. The Cara period came to an end about 1450 when the Inca Tupac Yupanqui began his successful campaigns against the southern allies of the Scyri.

This account of Velasco has been accepted by Means (1931, p. 125), Gonzalez Suarez (1890–1903, vol. 1, chap. 1), and Verneau and Rivet (1912 and 1922, vol. 6, pp. 14–21), among others. The authenticity of the chronicler has been attacked principally by Jijón y Caamaño.

Although there seems to be good reason to doubt some of the details of Velasco's account of the Cara movements and political organization, there are, on the other hand, valid linguistic and archeological grounds for believing that the plateaux of Imbabura were populated by a people from the coast several hundred years before the Inca invasion.

The culture of the Caras, mostly on the authority of Velasco, may be summarized briefly as follows: Clothing consisted of a large cloth draped over the shoulders and held with a sash around the waist. The weaving of cotton and wool, as well as the tanning of hides, was well known. Houses were small and round, of wattle covered with mud, and with roofs thatched with páramo grass on wooden frames. Principal foods consisted of maize, beans, potatoes, camotes, rabbits, quina, and a plant called *huacamullu.* The tribes in the valleys of Quilca and Pimampiro cultivated coca, which they traded to neighboring groups at a profit which gave them a higher standard of living than the others.

Cultivation of the fields was performed with a sort of wooden digging stick. Llamas were raised, but the meat was eaten by chiefs only. Arms consisted of the javelin which was used with a throwing stick, lance, and sling. Stones were used for axes and clubs. The people were very warlike, and in order to secure their victories, constructed fortresses in conquered provinces in the form of quadrangular terraplanes of three or four stages, with palisades in which were located structures housing the store of arms. Near the forts were villages where the officers and chiefs of the Province lived. They used a war drum of cylindrical shape made from a single hollowed piece of wood and provided with ears at each end for suspension. In burying the dead, they first stretched the body on the ground at some distance from the house and surrounded it with the jewels and arms of the deceased. Then they raised around it a wall of rough stones, the nearest relatives having the privilege of placing the first stones. These structures are known as *tolas.*

The king's graves were provided with a circular stone chamber with pyramidal stone roof and a door opening toward the east, which was opened only for the interment of a new corpse. The bodies of the kings were "embalmed," clothed in the royal insignia, and placed in a sitting position around the wall of the chamber.

The Caras are said to have worshipped the sun and the moon, and to have venerated the two heroes Pacha and Eacha. The temple of the sun was on the Panecillo, an artificial (?) hill to the south of Quito. The temple was quadrangular in form, constructed of well-cut stone, with a pyramidal roof and a door facing the east. Inside was only an image of the sun in gold. On each side of the door were two columns which served as gnomons for observation of the solstices, and around the building was a circle of 12 columns, indicating the position of their shadows at the beginning of each month. Offerings to the sun consisted mostly of perfumes, resins, fruits, and animals. The temples of the moon were situated on a hill at the opposite end of the city to the north. It was of circular form with round windows, and in the center a silver image of the moon. Above the moon hung a piece of blue cotton cloth representing the sky in which were fixed silver stars. The first day of each lunar month was consecrated to this divinity.

The foregoing is Velasco's account of the Cara religion, but other sources mention such customs as the worship of pumas and large snakes, which we may assume represented the more primitive aspect of Cara religion.[1]

Verneau and Rivet say "the sun cult seems to be of Peruvian origin as Cieza de León declares it to be in the case of the tribes of Chillo and Alangasi (near Quito). Before the coming of the Incas the Caras adored the sky, the high and snowy mountains, where they went under the conduct of their priests to carry sacrifices and offerings when they wished to obtain divine favors. The indigenes of Pimampiro and Chapi had wooden and stone representations of their gods to which they offered white maize, chicha, and coca" (Verneau and Rivet, 1912 and 1922, vol. 6, p. 19).

The political organization, according to Velasco, was a centralized aristocratic monarchy consisting of three classes—the Scyris or kings the nobles, and the commoners. The power of the kings, as well as that of the nobles, was inherited by sons to the exclusion of daughters, and in default of sons the title passed to the son of the ruler's sister. The new king did not take power until recognized by an assembly of the nobles who, if they considered him unworthy, appointed one of their number to take his place. This assembly, together with the king, decided all questions of general interest and particularly those relating to war. Each social class had its special insignia. All those capable of bearing arms wore a feather crown with a single row of feathers. Nobles' crowns had two rows of feathers. The king wore the latter type, decorated with a large emerald suspended in the center of the forehead. Real and personal property were both inherited.

The Scyri had only one wife, but many concubines, a privilege which was allowed the nobles. Polygamy was prohibited for the common people but divorce was easy and frequent.

The Caras were known to be very good lapidaries, especially skillful in cutting emeralds.

Although they had no writing, they possessed a form of annotation of events and accounts which consisted of placing in compartments of wood, clay, or stone little pieces of stone of different colors and forms. These records were kept in the temples.

---

[1] For summaries of Cara culture, see Verneau and Rivet, 1912 and 1922, vol. 6, pp. 20 ff., Means, 1931, pp. 145-155, González Suarez, 1890-1903, vol. 1, pp. 86 ff.; for original source, see Velasco, 1841-44, vol. 2, pp. 393 ff.

So much for a rapid sketch of the Cara culture at the time of the Spanish conquest, as reported by Velasco. Many features suggesting Peruvian influence on a substratum of independent culture will be at once recognized. From our point of view it is important to remember this Peruvian influence because it may indicate the possibility of the infusion of Peruvian blood as well. Other evidence also speaks for such admixture.

The resistance offered by the Cara tribes to the Inca conquest in the present Province of Imbabura was very fierce, and they succeeded in holding their own against the Peruvian armies for at least 17 years. In this struggle the people of Cayambe, Pifo, Otavalo, Cochasqui, and Caranqui were especially active, and they were only defeated in the end by a stratagem which resulted, as Cieza de León tells us (1853, pp. 255–260), in the slaughter of all the able-bodied men at Yaguarcocha (Quichua: Lake of Blood), some 5 miles north of the present town of Ibarra. The survivors were called *Huambracunas*, meaning "children." If this account is true, a large part of the Cara blood of the Province was wiped out about 1467.

After the massacre, Huayna Capac is said to have repeopled the Province with *mitimaes* sent from Peru (Cieza de León, 1853, p. 258). Unfortunately, we do not know from precisely which part of Peru these colonists came, but Verneau and Rivet (1912 and 1922, vol. 6, p. 21) on the authority of a reference the writer has not been able to check, mention that the village of Zambiza, situated across a mountain spur some 10 miles to the northeast of Quito, was entirely peopled by Indians sent from the boundary between Peru and Bolivia.

A review of the historical material, therefore, tells us of at least three physical strains which may be involved in the present population of Imbabura: (1) The first inhabitants of which we know anything, called *Quitus* by Velasco, the people who were inhabiting the plateau at the time of the Cara invasion; (2) the Caras, coming from the coast and probably possessing blood foreign to the territory of Ecuador, if the tradition of their arrival from overseas on rafts is to be taken seriously; (3) Peruvians of uncertain physical type, who came in as soldiers and colonists at the time of the Inca conquest. Let us see what light the other lines of evidence may throw on the problem.

Jijón (1920, pp. 103–105) summarizes the succession of cultures in Imbabura as follows: (1) Painted-vase period, which is earliest, characterized by painted vases of one or two colors on a clear ground;[2] (2) well-grave period, in which bodies are buried in lateral gallery at the base of a well 2 to 4 meters deep; (3) *Tola* period, which the author and others have proved to precede the Inca period (Verneau and Rivet, 1912 and 1922, p. 125; von Buchwald, 1909, p. 156); (4) the Inca period, which in Imbabura was neither—

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[2] The author says that they are possibly associated with burials in wells under *tolas*, although this seems doubtful on the evidence which he presents.

> very durable nor very intense. In those places like Caraqui in which the Inca founded stable cities the people were made vassals. In other parts of the territory the Inca influence was confined to numerous intrenched camps and the leaving of vases, while aboriginal life went on side by side with the Peruvian. [Jijón, 1920, p. 105.]

In another work, Jijón (1930) has given a general chronology for the pleateau part of Ecuador, based principally on the stratified site of San Sabastian near the town of Guano in the Province of Cotopaxi. The succession of cultures, beginning with the oldest, is as follows: (1) Proto-Panzaleo I, wavy, comb-made figures incised on pottery, ?—200 B. C.; (2) Proto-Panzaleo II, large decorative motifs on pottery in negative painting, 200 B. C.–0; (3) Tuncahuan, pottery decoration consisting of negative and over-painting, A. D. 0–750; (4) Guano, pottery showing influence of Tiahuanaco, A. D. 755–850; (5) Elenpata, very stylized, small motifs of textile aspect in negative technique, common to Manta style of same date, A. D. 850–1300; (6) Huavalac, applied faces with bent noses, engraved figures, and remains of negative painting of the preceeding period, A. D. 1300–1450; (7) Puruhaincaico and Inca, 1450–1532.

The significance of this for us, lies in Jijón's views concerning the foreign affiliations of these cultures, which he supports with a thorough study of comparative material. According to him, a primitive population, like that of the Fuegians or the ancient fishermen of Africa, was succeeded by another which was represented by the diffusion of an archaic culture element somewhat like that of the Valley of Mexico, and here represented by Proto-Panzaleo I. This archaic culture was followed by new cultural waves connected with the southern advance of the Chorotegas before 100 B. C. and represented in Ecuador by Proto-Panzaleo II. This culture was, in turn, followed by yet another wave of Chorotegan influence (Tuncahuan) which was already influenced by the art of the old Maya Empire. The latter wave of culture was met by and blended with a wave of Tiahuanaco influence from Peru, represented by Jijón's Guano. Jijón claims that Proto-Panzaleo II and the Guano types have been found in the Province of Imbabura, thereby indicating early intrusions of culture, and possibly of peoples, first from the Chorotegan area and, secondly, from Bolivia and Peru.

Without repudiating the existence and direction of foreign influences, Means has criticized Jijón's succession of cultures as failing—

> to show the existence of any vivid and deep-reaching contrast between the various types. It is quite possible to lump all his types together and say they represent

> merely a culture which, beginning as a low archaic culture (an integral part of that so widespread in Central and South America), gradually worked its way up through the various grades of the archaic stage until it attained a stage which, though preserving traces of archism (in modelled human faces particularly), was, nevertheless, on a par with Tianhuanco II art in its later years and, like it, was possessed of a metallurgic art. Throughout all this long and gradual upward climb, influences were received far more constantly from the north, i. e., from Colombia and Central America, than they were from the south. Nevertheless, there are clear evidences of influences of an aesthetic sort derived from Tiahuanaco II art toward the end of its career. [Means, 1931, pp. 158–159].

In going through the literature, the writer has been able to find no evidence that an extensive migration accompanied the Tiahuanaco cultural influences from the south, and, since the latter occur with some scarcity in Imbabura, we may conclude for the time being that little infusion of Peruvian or Bolivian blood took place prior to the Inca invasion. There is more to be said, however, for both cultural and physical connection with the north.

Gonzalez Suarez was of the belief that the Caribs exercised a strong early influence in Imbabura, basing his belief on finds of occasional urn burials, which he apparently considered to be a Carib trait. Verneau and Rivet (1912 and 1922, vol. 6, p. 127), however, consider these interandiane urn burials to be diffusions from the coast, where such finds have been recovered as far south as central Peru. It is also claimed, on what seems to be rather insufficient evidence to date, that certain names, such as Imbabura, Cayambe, and Cotopaxi, are of Carib origin. One should not say, however, that there has been no Amazonian influence on the Plateau.

Uhle (1922, pp. 205 ff.; 1932) has summarized the archeological evidence and has made out a good case for the presence of strong Central American influence both on the coast and in the highlands, including Imbabura. This view is, the writer believes, accepted by most students of the subject (Means, 1921; Jijón, 1930, etc.), although Dr. Samuel Lothrop says that recent finds of Ecuadoran material in Nicaragua show that the cultural movement was not all in one direction.

Let us now return to Velasco's story of the Cara invasion of Imbabura via the Rio Esmeraldas and see what archeological evidence exists in support of it.

Jijón has summarized three facts which indicate, at least, that the pre-Inca inhabitants of Imbabura must have come from a forested region with a climate different from that of Imbabura, presumably a tropical forest region, since the nearest temperate forest is some 1,500 miles away in Chile (Jijón, 1920, pp. 117–120). These three indications are as follows, according to Jijón:

1. According to early accounts, the fort erected by the Caranquis for the defense of Yaguarcocha was made of wooden palisades

indicating an origin in a country where trees were plentiful. Except at Yaguarcocha there is no other locality in Imbabura where it is possible to obtain trees for this purpose.

2. The Caranquis used rafts on Yaguarcocha and the Lago de San Pablo, the only two lakes of any size in the region. These lakes, however, contain no fish and are too small to necessitate building rafts to cross them rather than walking around.

3. The house construction, depending on much use of wood is more appropriate to forested regions than to Imbabura.

The closest tropical forests are those of the Amazon valley and those of the Ecuadoran coast. Since the cultural elements in question are more like those of the latter region than the former, Jijón assumes that their presence among the Caras indicates a migration from the coast.

In addition to these facts, we may mention that the counting devices mentioned by Velasco have actually been found in strata immediately preceding the Inca (Verneau and Rivet, 1912 and 1922, pl. 15; Means, 1931, p. 168) and *tolas* are found in Manta and Esmeraldas which resemble those in Imbabura and also those described by Velasco. Further finds by Saville on the coast have been assigned to the Caras. There is, then, a strong presumption in favor of Velasco's account of an actual invasion from the coast. Furthermore, as we have said, there is good reason to believe that these people who came from the coast originally hailed from Central America. (See Gillin, 1936, p. 549, for short bibliography of coastal archeological finds attributed to the Caras.)

The language of the Caras is completely extinct except for 10 place names and their meanings. Say Verneau and Rivet (1912 and 1922, vol 6, p. 20):

> insufficient as they are, their study has permitted the recognition in two of these names of a root belonging without doubt to the language of the Barbacoa Indians who lived on the western slope of the cordillera and who themselves belonged to a Chibcha stock. There is every reason to believe that the language spoken by the ancient inhabitants of the region was a Barbacoan (i. e., Chibchan) dialect.

Beuchat and Rivet have established the fact that the three languages formerly known as Barbacoa, Paniquita, and Coconuco of the Ecuadoran and Colombian coasts all belong to the Chibchan stock. It also seems probable that the Chibcha languages were at some time spoken as far north as the frontier between Nicaragua and Costa Rica.

This summary of background material has been made by way of uncovering clues regarding the antecedents of the present inhabitants of Imbabura. On the basis of this material we may say that the Imbabura population *may* be composed of the following strains:

(1) A very ancient aboriginal element; (2) a coastal element which possibly came to the Eucadoran coast from Central America or at least from the north; (3) possibly some Amazonian elements, although the linguistic, archeological and historical evidence is largely silent with respect to them; (4) a Peruvian factor which might have been introduced as a result of the Inca conquest; and (5) possibly some white admixture acquired since the Spanish conquest, although records of such miscegenation are lacking. We shall now consider the physical characteristics of the Indians actually studied. It should be understood, of course, that our use of the word "strain" here signifies only population elements derived from external geographical regions and does not necessarily imply major "racial" distinctions.

RESULTS OF ANTHROPOLOGICAL WORK

In table 1 are given the statistical results of the measurements of all the Imbabura Indians studied. Attention may be called to a few of the more important features of the group as a whole. The mean stature of 156.48 centimeters places the group within the range of the "short" portion of the human species (Martin, 1928, vol. 1, p. 246). With a mean cephalic index of 80.04, these Indians are on the average mesocephalic. The hypsicephalic mean length-height index of 72.44 and the acrocephalic breadth-height index of 90.26 indicate that the typical head is quite high relative to either the length or the breadth.

The typical face is of medium length relative to its breadth as shown by the mesoprosopic mean total facial index of 84, while the upper face is relatively somewhat broader with a euryene mean upper facial index of 47.54. The nose is of medium width compared with its height as indicated by the mesorrhine mean nasal index of 72.34.[3]

The shoulders (biacromial width) are 23.12 percent of the stature. The average chest is 78.58 percent as deep as it is wide. The relative sitting height is 52.6 percent. The forehead is narrow in comparison with the head, the fronto-parietal index being 70.12, but the head itself is very nearly as broad as the face, as shown by the mean cephalo-facial index of 96.71.

All the bodily and cephalic measurements fall within the small or medium ranges of the human species, with the exception of the head height, which is fairly large.[4]

In table 2 are the results of the morphological observations of the group as a whole.

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[3] For indicial categories here mentioned, see Martin, 1928, vol. 1, pp. 199-202.

[4] Measuring technique followed the system taught by Prof. E. A. Hooton, of Harvard University. Head height was taken with anthropometer from tragion on left side; chest measurements were taken with anthropometer at height of nipples on the normally deflated chest from in front and from left side; skin color was determined by comparison with the Von Luschan porcelain color chart; eye and hair color were judged without reference to a chart. Calculations were performed by machine in the Harvard Anthropometric Laboratory by Mrs. Sarah Cotton. All measuring was done by the writer, recording by Helen N. Gillin.

Skin color is overwhelmingly red brown, with less than 14 percent of the cases distributed among other shades of brown (brunet, swarthy, light brown). Seven-tenths of the cases show no vascularity, with about 30 percent showing small or pronounced vascularity. The same proportions hold for freckles. About 69 percent of the subjects have a few moles and 25 percent have many, while only 5 percent are free of moles. The hair form is more curly than might be expected a priori in an Indian group, with only 19 percent showing straight hair, while 56 percent have light waves, and 25 percent deep waves. Hair texture is predominantly fine and medium, with only one case of coarse hair recorded.

The largest proportion of heads have a medium amount of hair, but 27 percent show a more than medium quantity. Less than 7 percent of baldness of any degree is recorded. The Imbabura men have scanty beards, 89 percent being recorded as "small" or "very small," while only 11 percent have beards of medium heaviness. Body hair is also small in quantity, with only 6 percent having even a medium amount.

One-tenth of the subjects showed gray hair on the head, while 17 percent showed grayness of some degree in the beard. Ninety-four percent of all head hair is black, with 5 percent dark brown, while 98 percent of all beards are black. Three-fifths of the eyes are black, with practically all the rest recorded as dark brown. Clear irises lead with 57 percent, followed by the rayed, zoned, and spotted types in order of diminishing frequency. Thus the pigmentation of these men is predominantly brunet, with only a small incidence of lighter factors which might indicate mixture with whites.

In regard to eyefolds, a greater tendency toward the external and median types is found than toward the internal eyefolds, although all types are fairly well distributed. Thus 16 percent of the subjects show no indication of external eyefold, 11 percent show no indication of median eyefold, but 21 percent are devoid of the internal type. Sixty-six percent, however, show some degree of eye obliquity. About two-thirds of the eye openings are small, with one-third medium in size.

The eyebrows tend to be small or medium in thickness, while nearly two-thirds of them meet over the nose, although the greater part of this concurrency is small. The greater part of brow ridges is small and less than 7 percent are medium in size. The forehead height is predominantly small or medium, with a slightly larger percentage falling in the latter category. The slope of the forehead is medium in slightly more than half the cases, but the two-fifths of nearly straight foreheads (as indicated by a "small" slope) is large enough to be remarked.

A nasion depression is always present and in 16 percent it is marked. A nasal root of some height is typical, with seven-tenths showing a medium height and one-quarter of the subjects showing a nasal root of some height. Three-fourths of the nasal roots are medium in breadth, while the remainder are about equally divided between narrower and wider types. The lower border of the nasal septum in profile tends toward convexity, with three-fifths of the subjects in this category and the other two-fifths showing concave or straight septa.

The nasal bridge is well elevated in the great majority of the cases, being of medium height in 69 percent and of more than medium height in 28 percent. The nose is not aquiline, however, for the bridge tends toward broadness with 97 percent showing double or triple-plus breadths. The largest proportion of noses are straight in profile (40 percent), while 23 percent are convex, and the concave and concavo-convex types are about equally divided with a little more than 17 percent each. Ninety percent of the tips show either medium or pronounced thickness, although the former type is twice as frequent as the latter. The up-tilted and down-tilted nasal tips occur in about equal proportions and only 15 percent of the nasal wings are compressed in some degree, with 66 percent medium and 19 percent flaring. The relatively high frequency of transverse nostrils (41 percent) indicates that there is no perfect correlation between shape of nostril and flare of wings in this group.

The integumental lips tend toward thickness (45 percent), while the medium type with 37 percent is about twice as frequent as the thin type with 19 percent. The membranous lips are for the most part of medium thickness but there are more full lower membranous lips than upper ones. Eversion is generally small and medium.

About 95 percent show some midfacial prognathism, although it is mostly small in size. Alveolar prognathism is more pronounced. The chin is prominent in roughly two-thirds of the cases and small in one-third. The bilateral type of chin is twice as frequent as the median type.

Only about 11 percent of the men show partial eruption of the teeth. The majority bite edge-to-edge, with the overbite type accounting for roughly 40 percent and the underbite occurring in less than 4 percent of the cases. Only about two-fifths of the men have all their teeth, 31 percent have lost between 1 and 4 teeth, 11 percent have lost between 5 and 8 teeth, 7 percent have lost 9 to 16 teeth, and nearly 10 percent have lost more than 17 teeth. The largest proportion show heavy wear and less than one-fifth of the teeth show little or no wear. Only about 1½ percent of the men had no caries in their teeth and almost 30 percent had 17 or more cavities. Shortening occurs in only a little over one-third of the cases, but crowding is present in about 86 percent.

The helix of the ear is of medium size in exactly half the cases, but the well rolled helix is about 10 percent more frequent than the slightly rolled type. The antihelix is medium in slightly more than half the cases, but here the small type is twice as frequent as the pronounced type. Darwin's point occurs in some form in 36 percent of the subjects. The attached ear lobe is most frequent (45 percent), while the soldered type occurs slightly oftener than the free type. Less than 10 percent of the ears are of markedly large size, while the majority are of medium size. Seventy-three percent show little protrusion. Temporal fullness tends to be medium (79 percent), while the incidence of submedium fullness (15.38 percent) is about three times as great as that of the pronounced type (5.38 percent).

The author regards the recorded incidence of occipital and lambdoid shapes as somewhat unreliable, due to the difficulty of taking precise observations on subjects who wear their hair braided in the back as these do. However, little evidence of marked cranial deformation was found.

The subjects are for the most part of medium or lateral body build, only 11 percent conforming to the linear type.

The whole group has been divided into two subgroups, which we shall term the Otavalo group and the Angachagua group respectively. The Otavalo group includes, as previously stated, Indians measured at Otavalo, San Roqué, and Agato. The Angachagua group is geographically more isolated than the Otavalo group and is also regarded by the Indians themselves and whites in the country as being of different physical aspect. The two groups have been compared statistically to see if this assumption is true from the anthropometric point of view. In table 3 are presented the statistical results of the measurements taken on the Otavalo group; in table 4 will be found the tabulation of the morphological observations on the same group. In table 5 are the results of the anthropometric measurements at Angachagua and in table 6 the listing of the morphological observations for the same group.

In comparing the two groups we find slight differences in variability, indicating that the Otavalo group is a bit less homogeneous than the Angachagua group, as would normally be expected because of its greater size. The average coefficient of variation for measurements of the Otavalo group is 5.37 as compared with 4.91 for the Angachagua group, while the average coefficient of variation for the indices is 5.57 for the Otavalo group as compared to 5.17 for the Angachagua group. (Coefficients of variation will be found in tables 3 and 5.)

When we compare the differences between the groups as expressed by the "×P.E."[5] (table 7), we find them of such a degree and character as to make it impossible for us to consider the two groups as samples of the same universe. An arbitrary measure of difference frequently used is 3×P.E., because, on the basis of the normal frequency curve, 95.70 percent of the differences between any two random samples of the same universe will fall below 3×P.E. In comparing the Angachagua and Otavalo samples (table 7), however, only 66.67 percent of the differences, both in measurements and indices, fall within 3×P.E. Actually, 69.23 percent of the measurements and 64.29 percent of the indices show ×P.E.'s of under 3. In other words, the number of insignificant differences is only about two-thirds as great as it should be were we to consider the two groups as members of the same population physically.

Angachagua exceeds Otavalo significantly in head height and sitting height, whereas Otavalo significantly exceeds Angachagua in head breadth and nose breadth. In indicial characters, Angachagua significantly exceeds Otavalo in relative shoulder breadth, length-height index of the head, and breadth-height index of the head, while Otavalo significantly exceeds in cephalo-facial and nasal indices. Thus these two groups, in accordance with popular belief previously mentioned, are actually different on the basis of the present samples. The Angachagua group typically has an absolutely and relatively higher head, an absolutely and relatively narrower nose, narrower shoulders relative to stature, an absolutely narrower head, and a face broader in relation to the breadth of the head.

COMPARISON OF RESULTS OF ANTHROPOLOGICAL WORK IN PROVINCE OF IMBABURA WITH APPOSITE SERIES FROM OUTSIDE THE AREA

In an effort to throw some light on the affinities of the Imbabura Indians we have collected a number of series of measurements made upon Indians who on the basis of historical, archeological, and linguistic evidence may possibly have sprung from stocks represented in the ancestry of the Imbabura. In these series are included all the measurements on Quichua Indians which are known to the author, namely, those reported by Chervin and Rouma from Bolivia and those reported by Ferris from Peru.

In tabulating the foreign series for comparison, males only have been selected and only those traits have been utilized in which the technique of the several investigators appears to have been identical with that of the present study. Since in only one case—Steggerda's series of Mayas—has the statistical treatment accorded these various groups been sufficient to permit direct comparisons of any validity, putative probable errors and putative ×P.E.'s have been calculated for these comparative series.

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[5] $\times \text{P. E.} = \frac{\text{difference between two means}}{\text{probable error of the difference}}$. Probable error of the difference $= \sqrt{\text{P. E.}_A^2 + \text{P. E.}_B^2}$.

The reader who is sophisticated in the interpretation of statistics will realize at once how tentative must be any conclusions drawn from the available anthropometric material of the Andean area. Anthropometric series are in most cases too small to be of high validity statistically. The factors which may have influenced investigators in selecting individuals for samples are not wholly clear in all cases. The number of traits measured by comparable methods varies from sample to sample. It will be clear, therefore, that the material as we have presented it is suggestive rather than conclusive. A service can be performed for future investigators, however, by drawing together the material available at the present time and giving it the statistical treatment which will make for ready comparison with new data as it is collected. In this sense it is hoped that the present paper may serve as a starting point for extensive anthropometric investigations which will finally provide us with a clear picture of the physical attributes of the Andean populations.

A few cautions should be mentioned. We have compared all series from this area by means of differences and probable errors. This was done in order to provide the most refined check available regarding the significance of the arithmetic means involved. It should be remembered, however, that good judgment and common sense are also part of the statistical method. Thus, until vastly more material is available the reader should not be too quick to form the conclusion that several different "races" are represented in the Andean area. No two of the series when compared with Otavalo and Angachagua, or when compared with each other, are statistically parts of the same population universe. Yet we must remember that the samples are in all cases relatively small, in some cases very small. Further sampling may show the apparent differences to be less important than they appear to be at present. In the second place, the number of comparable means provided by other investigators is in some cases very small. Thus Chervin provides only seven measurements and six indices which are comparable. A single significant difference between one of these means and that of another series will produce a percentage of significant differences between the two arrays sufficient to make it appear that the two populations involved are highly different. Yet, if a larger array of means were available for comparison, it is conceivable that the degree of difference would appear much less imposing. In short, the percentages of significant differences between means in small arrays and those in much larger arrays must not be considered of equal importance until more data is available. Third, it is never absolutely clear, unless the investigators have been able to compare their methods of measurement in person, that the techniques are comparable. Particularly is this true in the present case where few of the investigators, who have provided us with comparative material, have described their techniques fully. A very slight error in locating nasion, say, would be sufficient to produce significant differences. Finally, it must be repeated that, with the exception of Steggerda's Maya series, all comparative series used here were published either in the form of raw data or were given that elementary mathematical treatment which consists of drawing up simple arithmetic means. In some quarters such simple treatment of anthropometric data at publication is praised for its "simplicity" and "common sense," but the fact is that it provides no check on the validity of the sample and greatly hinders the process of comparison with other samples. This lack of comparable statistical technique has meant that we have had to compare the series through putative probable errors, which we now proceed to do.

The putative probable error for statistically untreated series is obtained by the following formula:

$$\frac{0.6745 \text{ standard deviation of own series}}{\sqrt{N} \text{ of comparative series}}$$

The use of this formula, of course, involves the assumption of the same variability in the comparative series as in our own series and, therefore, cannot be regarded as being as precise as the regular method. However, with this putative probable error the ×P. E. may be calculated for comparison. As a test of this method the ×P. E. was calculated by both the regular and the putative methods in a comparison between the whole Imbabura series and Steggerda's series of Maya Indians. (The data for the latter are presented in table 35.) As shown in table 36, the average ×P. E. calculated by the regular method is somewhat larger (by 1.16 points) than that calculated by the putative method. In comparing the two series, the percentage of insignificant differences (as indicated by ×P. E. under 3) is the same in the comparison of measurements, but 20 percent of the indices are not significantly different under the regular method, whereas 40 percent of the indices are not significantly different under the putative method. (See table 41, ranks 2 and 3.) In order to allow for possible errors of variability, which the use of the putative method implies, it has been decided to use 4×P. E. instead of 3×P. E. as a test of group likeness in comparisons involving those groups with which the putative method must be used. In other words, we assume that 4 ×P. E. under the putative method marks the limit of insignificant differences, whereas 3×P. E. is the limit of insignificant difference under the regular method.

Since it has been shown that the Otavalo and Angachagua groups are apparently not parts of the same physical group, the writer has compared the Otavalo group alone with each of the foreign series. In addition, however, because most of the comparative series are made up of measurements covering several localities within their respective general areas and, therefore, may possibly be somewhat heterogeneous, he has compared the whole Imbabura group (Angachagua and Otavalo groups combined, table 1) with each of the foreign series. If space had permitted, it would also have been logical to compare the Angachagua group alone with the several foreign groups, but since it is composed of only 26 individuals this procedure was omitted.

The data given by the several authors used in this comparison are to be found in tables 8 to 35 inclusive. The differences and ×P. E.'s involved in comparisons with the whole Imbabura group will be found in tables 9, 10, 14, 15, 19, 20, 21, 26, 29, 30, 31, and 36. The differences and ×P. E.'s. concerned in the comparisons with the Otavalo group are tabulated in tables 11, 12, 16, 17, 22, 23, 24, 27, 32, 33, 34, and 37.

No attempt at a trait-by-trait comparison will be made here, although in the indicated tables the statistical results of the comparison of each trait may be found. We shall content ourselves here with the measure of racial similarity indicated by the proportion of traits in the foreign groups which are not statistically differentiated from the Imbabura. In table 38 the percentages of comparable traits (×P. E. of under 4) of the total Imbabura group and the 12 foreign groups have been tabulated. Separate percentages have been calculated for measurements and indices. On this basis the comparative groups may be ranked as follows in the order of their diminishing likeness to the Imbabura group as a whole for absolute measurements: (1) Ferris Machiganga (63.64 percent); (2) Chervin Quichua, Chervin Aymara, Farabee Machiyenga, and Steggerda Maya (all 50 percent); (3) Barrett Cayapa (44.44 percent); (4) Ferris Quichua, series 2 (36.36 percent); (5) Farabee Piro (35.71 percent); (6) Farabee Sipibo (28.57 percent); (7) Ferris Quichua, series 1 (20 percent); (8) Rouma Aymara and Rouma Quichua (both 18.18 percent). The percentages in parentheses in this ranking indicate in each case the percentage of insignificant differences shown by the series when compared with the whole Imbabura group.

When ranked on the basis of indices, the order is as follows: (1) Rouma Aymara (71.42 percent); (2) Chervin Quichua, Ferris Quichua, series 2, Ferris Machiganga, Farabee Machiyenga, Farabee Sipibo (all 50 percent); (3) Ferris Quichua, series 1 (42.86 percent); (4) Steggerda Maya (40 percent); (5) Farabee Piro (33.33 percent); (6) Rouma Quichua (28.57 percent); (7) Chervin Aymara (25 percent); (8) Barrett Cayapa (no insignificant differences).

If the measurements and indices are thrown together and percentages of likeness calculated, as in table 39, the order of diminishing likeness is as follows: (1) Ferris Machiganga (58.82 percent); (2) Chervin Quichua and Farabee Machiyenga (50 percent); (3) Steggerda Maya (47.37 percent); (4) Ferris Quichua, series 2 (41.18 percent); (5) Chervin Aymara (40 percent); (6) Rouma Aymara (38.89 percent); (7) Farabee Sipibo and Farabee Piro (35 percent); (8) Barrett Cayapa (30.77 percent); (9) Ferris Quichua, series 1 (29.41 percent); (10) Rouma Quichua (22.22 percent).

The group which consistently shows the greatest affinity for the Imbabura total group is the Machiganga or Machiyenga, a jungle tribe on the upper Rio Huallaga in Peru. Of the four Quichua groups that of Chervin from Bolivia shows consistently the greatest similarity to the Imbabura Quichuas, but this comparison is based on a smaller number of traits than is the case with the other Quichua groups. On the whole the Aymara groups show more similarity than do the Quichua groups. None of these foreign groups is a sample of the same statistical universe as the Imbabura group.

In table 40 will be found the percentages of like traits in the comparison of the Otavalo group alone with the foreign groups. Ranking of measured traits in order of diminishing likeness to Otavalo follows: (1) Chervin Quichua and Chervin Aymara (67 percent); (2) Ferris Machiganga (64 percent); (3) Farabee Machiyenga (50 percent); (4) Farabee Sipibo and Steggerda Maya (43 percent); (5) Farabee Piro (33 percent) and Barrett Cayapa (33 percent); (6) Ferris Quichua, series 2 (27 percent); (7) Ferris Quichua, series 1, and Rouma Aymara (20 percent); (8) Rouma Quichua (18 percent). Ranking on the basis of insignificant differences in indicial traits follows: (1) Rouma Aymara (83 percent); (2) Ferris Quichua, series 2, and Farabee Sipibo (67 percent); (3) Chervin Quichua, Ferris Machiganga, and Farabee Machiyenga (50 percent); (4) Steggerda Maya and Farabee Piro (40 percent); (5) Ferris Quichua, series 1, (33 percent); (6) Chervin Aymara (25 percent); (7) Rouma Quichua (17 percent); (8) Barrett Cayapa (no insignificant differences). When both measurements and indices are lumped together and like traits calculated on this basis, the order of diminishing likeness to Otavalo is as follows: (1) Chervin Quichua (60 percent); (2) Ferris Machiganga (59 percent); (3) Chervin Aymara, Farabee Machiyenga and Farabee Sipibo (50 percent); (4) Rouma Aymara (44 percent); (5) Steggerda Maya (42 percent); (6) Ferris Quichua, series 2 (41 percent); (7) Farabee Piro (35 percent); (8) Ferris Quichua, series 1 (25 percent); (9) Barrett Cayapa (23 percent); (10) Rouma Quichua (18 percent).

Of the comparative groups, Chervin's Quichua and Ferris' Machiganga are most like the Otavalo group, in the sense that they have the highest porportion of traits like Otavalo. If we consider, not percentages, but the absolute number of similar traits, an examination of the comparative tables will show that the Machiganga, Machiyenga, and Sipibo lead the field in this respect, each with 10 traits similar to Otavalo. Of the Quichua-speaking groups, Ferris' Peruvian series 2 leads with 7 traits similar to Otavalo, followed by Chervin's Quichuas from Bolivia.

CONCLUSIONS

If we bear in mind the inadequacy of the comparative material and the possible weaknesses of the method used here, we may draw some tentative conclusions which may be helpful for future research:

1. The Otavalo and Angachagua populations do not show enough similarities of a significant kind to be considered, on the basis of the present samples, parts of the same statistical universe. Larger samples might, of course, alter this picture.

2. Neither the whole Imbabura group nor the Otavalo section of it shows enough traits in common with any of the other groups used for comparison to be considered, in the light of the present data, samples of the same physical type.

3. We have compared the Imbabura samples with series from a number of foreign areas which, in the light of cultural evidence, might conceivably have contributed at some time to the make-up of the present Imbabura population. The foreign groups showing the greatest affinities for the Otavalo population are now living in the Amazon drainage—the Machiganga, Machiyenga, and the Sipibo. Since these peoples live close to the mountains and there is some reason to believe that they may have had access to the highlands and vice versa, it is conceivable that the Otavalo and the Machiganga-Machiyenga, in particular, represent marginal peoples of an earlier physical strain of the Inca area, modified or pushed back in later Inca times by other elements from the Peruvian highlands. Our facts no more than hint at this, but it is at least interesting to note the relatively small and inconsistent similarity between Otavalo and the Quichua-speaking groups.

4. The four comparative Quichua groups plus the Imbabura groups show so many differences of statistical significance when compared with each other that we have no basis for believing in a "Quichua" or an "Inca" physical type among living inhabitants of the Inca area which might represent a universal correlation with the Quichua language. This will not be surprising to those who are familiar with the methods whereby the Quichua language was spread by conquest.

5. The differences between the Otavalo group and the Chibcha-speaking Cayapa, living on the tributaries of the Esmeraldas and possibly to be regarded as descendants of the ancient Cara, are so great as to indicate, at least, that the Cara blood has completely disappeared either from the Cayapa or the Otavalo.

6. Very few similarities exist between Otavalo and the Maya group used for comparison.

To sum up, the present study has indicated a considerable heterogeneity of physical type among living populations of the Andean highlands and contiguous areas, with the Quichua-speaking population of the Province of Imbabura showing the greatest affinities with certain tribes of the upper Amazon drainage. Further research on a fairly large scale will be required to answer the questions thus raised.

APPENDIX

TABLES OF ANTHROPOMETRIC MEASUREMENTS AND PHYSICAL OBSERVATIONS

TABLE 1.—*Anthropometric measurements and indices of male Indians from the Province of Imbabura, Ecuador, including all measurements taken from Otavalo, Agato, San Roqué, and Angachagua* [1]

Trait	Number	Range	Mean	P.E.	S.D.	P.E.	*v*	P.E.
Measurements:								
Stature	133	140–172 (c)	156.48	±0.33	5.67	±0.23	3.62	±0.15
Biacromial	134	28– 45 (c)	36.35	±.12	1.98	±.08	5.45	±.22
Chest breadth	133	23– 37 (c)	27.69	±.10	1.72	±.07	6.18	±.26
Chest depth	133	18– 29 (c)	21.74	±.09	1.54	±.06	7.08	±.29
Sitting height	133	75– 95 (c)	82.48	±.19	3.24	±.13	3.93	±.16
Head length	134	167–208 (m)	184.65	±.37	6.39	±.26	3.46	±.14
Head breadth	134	135–158 (m)	147.76	±.27	4.71	±.19	3.19	±.13
Head height	110	110–153 (m)	133.82	±.43	6.76	±.31	5.05	±.23
Minimum frontal	134	89–120 (m)	101.34	±.27	4.56	±.19	4.50	±.18
Bizygomatic	134	130–164 (m)	142.80	±.29	5.05	±.21	3.50	±.14
Bigonial	134	94–145 (m)	107.06	±.42	7.28	±.30	6.80	±.28
Total face height	134	100–144 (m)	120.10	±.34	5.90	±.24	4.91	±.20
Upper face height	134	55– 74 (m)	67.75	±.27	4.60	±.19	6.79	±.28
Nose height	134	44– 67 (m)	52.58	±.23	3.92	±.16	7.46	±.31
Nose breadth	133	31– 57 (m)	38.15	±.21	3.51	±.15	9.20	±.38
Indices:								
Relative shoulder breadth	134	16– 27	23.12	±.07	1.24	±.05	5.36	±.22
Thoracic index	133	65–100	78.58	±.32	5.40	±.22	6.87	±.28
Relative sitting height	133	46– 57	52.60	±.10	1.64	±.07	3.12	±.13
Cephalic index	134	68– 88	80.04	±.19	3.18	±.13	3.97	±.16
Length-height index	110	61– 81	72.44	±.23	3.60	±.16	4.97	±.23
Breadth-height index	110	76–111	90.26	±.31	4.89	±.22	5.42	±.25
Fronto-parietal index	134	63– 83	70.12	±.18	3.09	±.13	4.41	±.18
Cephalo-facial index	134	88–108	96.71	±.19	3.30	±.14	3.41	±.14
Zygo-frontal index	134	64– 83	72.62	±.18	3.16	±.13	4.35	±.18
Fronto-gonial index	134	90–139	103.40	±.40	6.90	±.28	6.67	±.27
Zygo-gonial index	134	66–104	75.16	±.27	4.56	±.19	6.07	±.25
Facial index	134	70– 94	84.00	±.27	4.70	±.19	5.60	±.23
Upper facial index	134	37– 57	47.54	±.20	3.36	±.14	7.07	±.29
Nasal index	133	52– 99	72.34	±.46	7.80	±.32	10.78	±.45

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[1] The following abbreviations are used in this and the following tables: "Number" signifies number of individuals measured, "P.E." signifies probable error, "S. D." signifies standard deviation, "*v*" signifies coefficient of variation, "(c)" indicates that the measurement in question is given in centimeters, "(m)" indicates that the measurement in question is given in millimeters.

TABLE 2.—*Total Imbabura group: Morphological observations*

Observations	Individuals	
	Number	Percent
Marital state:		
Single	11	8.40
Married	116	88.55
Widowed	4	3.05
Total	131	----------
Skin, color, breast, inner arm:		
Brunet	5	3.79
Swarthy	9	6.82
Red brown	114	86.36
Light brown	4	3.03
Total	132	----------
Skin, vascularity:		
Absent	93	69.40
Small	32	23.88
Medium	9	6.72
Total	134	----------
Freckles:		
Absent	93	69.40
Small	32	23.88
Medium	3	2.24
Pronounced	1	.75
Massed	5	3.73
Total	134	----------
Moles:		
Absent	7	5.22
Few	93	69.40
Many	34	25.37
Total	134	----------
Hair, form:		
Straight	25	18.66
Low waves	75	55.97
Deep waves	34	25.37
Total	134	----------
Hair, texture:		
Coarse	70	52.24
Medium	63	47.01
Fine	1	.75
Total	134	----------
Head hair, quantity:		
Small	5	3.73
Medium	93	69.40
Pronounced	36	26.87
Total	134	----------
Baldness:		
Absent	125	93.28
Small	7	5.22
Medium	2	1.49
Total	134	----------
Beard, quantity:		
Very small	60	44.78
Small	59	44.03
Medium	15	11.19
Total	134	----------
Body hair:		
Absent	2	1.50
Small	123	92.48
Medium	8	6.02
Total	133	----------
Grayness, head:		
Absent	119	89.47
Small	13	9.77
Pronounced	1	.75
Total	133	----------
Grayness, beard:		
Absent	111	82.84
Small	20	14.93
Medium	2	1.49
Pronounced	1	.75
Total	134	----------
Hair color, head:		
Black	126	94.03
Dark brown	7	5.22
Ash gray	1	.75
Total	134	----------
Hair color, beard, mustache:		
Black	131	97.76
Dark brown	2	1.49
Ash gray	1	.75
Total	134	----------
Eye color:		
Black	82	61.19
Dark brown	50	37.31
Dark light brown	2	1.49
Total	134	----------

TABLE 2.—*Total Imbabura group: Morphological observations*—Continued

Observations	Individuals	
	Number	Percent
Iris:		
Clear	76	56.72
Rayed	32	23.88
Zoned	25	18.66
Spotted	1	.75
Total	134	
Eyefold, external:		
Absent	22	16.42
Small	26	19.40
Medium	60	44.78
Pronounced	26	19.40
Total	134	
Eyefold, median:		
Absent	15	11.19
Small	13	9.70
Medium	77	57.46
Pronounced	29	21.64
Total	134	
Eyefold, internal:		
Absent	28	20.90
Small	54	40.30
Medium	40	29.85
Pronounced	12	8.96
Total	134	
Eye, obliquity:		
Absent	37	27.61
Small	51	38.06
Medium	36	26.87
Pronounced	1	.75
Down	1	.75
Down and small	7	5.22
Down and absent	1	.75
Total	134	
Eye, opening height:		
Small	86	64.18
Medium	48	35.82
Total	134	
Eyebrow, thickness:		
Small	54	40.30
Medium	75	55.97
Pronounced	5	3.73
Total	134	
Eyebrow, concurrency:		
Absent	52	38.81
Small	73	54.48
Medium	9	6.72
Total	134	
Brow ridges:		
Absent	1	0.75
Small	124	92.54
Medium	9	6.72
Total	134	
Forehead, height:		
Small	60	44.78
Medium	65	48.51
Pronounced	9	6.72
Total	134	
Forehead, slope:		
Small	56	41.79
Medium	70	52.24
Pronounced	8	5.97
Total	134	
Nasion depression:		
Very small	1	.75
Small	35	26.12
Medium	77	57.46
Pronounced	21	15.67
Total	134	
Nasal root, height:		
Small	7	5.22
Medium	93	69.40
Pronounced	34	25.37
Total	134	
Nasal root, breadth:		
Small	16	11.94
Medium	101	75.37
Pronounced	17	12.69
Total	134	
Nasal septum:		
Concave and straight	53	39.55
Convex	81	60.44
Total	134	
Alveolar prognathism:		
Absent	1	.75
Small	48	35.82
Medium	74	55.22
Pronounced	11	8.21
Total	134	
Chin, prominence:		
Small	46	34.33
Medium	86	64.18
Pronounced	2	1.49
Total	134	

TABLE 2.—*Total Imbabura group: Morphological observations*—Continued

Observations	Individuals	
	Number	Percent
Chin, type:		
Median	44	33.08
Bilateral	89	66.92
Total	133	
Teeth, eruption:		
Complete	117	88.64
Partial	15	11.36
Total	132	
Teeth, bite:		
Under	5	3.82
Edge to edge	74	56.49
Small, over	41	31.30
Pronounced, over	11	8.40
Total	131	
Teeth, loss:		
None	55	41.04
Very small, 1–4	42	31.34
Small, 5–8	15	11.19
Medium, 9–16	9	6.72
Pronounced, 17+	13	9.70
Total	134	
Teeth, wear:		
Absent, small	26	19.70
Medium	42	31.82
Pronounced and very pronounced	64	48.48
Total	132	
Teeth, caries:		
Absent	2	1.54
Very small, 1–4	42	32.31
Small, 5–8	25	19.23
Medium, 9–16	23	17.69
Pronounced, 17+	38	29.23
Total	130	
Teeth, shortening:		
Absent	82	62.12
Small	30	22.73
Medium	18	13.64
Pronounced	2	1.52
Total	132	
Teeth, crowding:		
Absent	19	14.50
Medium	90	68.70
Pronounced	22	16.79
Total	131	
Malars, frontal projection:		
Absent, small	4	2.98
Medium	42	31.34
Pronounced	88	65.67
Total	134	
Malars, lateral projection:		
Small	1	.75
Medium	31	23.13
Pronounced	102	76.11
Total	134	
Gonial angles:		
Small	6	4.48
Medium	57	42.54
Pronounced	71	52.98
Total	134	
Ear, helix (degree of roll):		
Small	27	20.15
Medium	67	50.00
Pronounced	40	29.85
Total	134	
Ear, antihelix (prominence):		
Absent	1	.75
Small	41	30.60
Medium	71	52.98
Pronounced	21	15.67
Total	134	
Ear, Darwin's point:		
Absent	85	63.43
Small	39	29.10
Medium	8	5.97
Pronounced	2	1.49
Total	134	
Nasal bridge, height:		
Small	3	2.24
Medium	93	69.40
Pronounced	38	28.36
Total	134	
Nasal bridge, breadth:		
Small	4	2.98
Medium	95	70.90
Pronounced	35	26.12
Total	134	

TABLE 2.—*Total Imbabura group: Morphological observations*—Continued

Observations	Individuals		Observations	Individuals	
	Number	Percent		Number	Percent
Nasal profile:			Lips; integumental:		
Concave	23	17.16	Small	25	18.66
Straight	54	40.30	Medium	49	36.57
Convex	31	23.13	Pronounced	60	44.78
Concavo-convex	26	19.40			
			Total	134	
Total	134				
			Lips; membranous, upper:		
Nasal tip, thickness:			Small	33	24.63
Small	12	8.96	Medium	74	55.22
Medium	83	61.94	Pronounced	27	20.15
Pronounced	38	28.36			
Very pronounced	1	.75	Total	134	
Total	134		Lips; membranous, lower:		
			Small	16	11.94
Nasal tip, inclination:			Medium	73	54.48
Up, medium	5	3.73	Pronounced	44	32.84
Up, small	63	47.01	Very pronounced	1	.75
Down, small	55	41.04			
Down, medium	11	8.21	Total	134	
Total	134		Lips, eversion:		
			Small	61	45.52
Nasal tip, wings:			Medium	68	50.75
Compressed	20	14.92	Pronounced	5	3.73
Medium	89	66.42			
Flaring	25	18.66	Total	134	
Total	134		Lips, seam:		
			Absent	5	4.03
Nostrils, visible front:			Small	48	38.71
Absent	57	42.54	Medium	36	29.03
Small, medium	75	55.97	Pronounced	35	28.23
Pronounced	2	1.49			
			Total	124	
Total	134				
			Midfacial prognathism:		
Nostrils, visible lateral:			Absent	2	1.49
Absent	17	12.69	Small	86	64.18
Present	117	87.31	Medium	42	31.34
			Pronounced	4	2.98
Total	134				
			Total	134	
Nostrils, shape:					
Thin	42	31.34	Ear, lobe:		
Medium	84	62.69	Soldered	40	29.85
Round	8	5.97	Attached	60	44.78
			Free	34	25.37
Total	134				
			Total	134	
Nostrils, axes:					
Parallel	1	.75	Ear, size:		
Oblique, small	12	8.96	Small	36	26.87
Oblique, medium	66	49.25	Medium	85	62.43
Transverse	55	41.04	Pronounced	13	9.70
Total	134		Total	134	

TABLE 2.—*Total Imbabura group: Morphological observations*—Continued

Observations	Individuals	
	Number	Percent
Ear, protrusion:		
Small	98	73.13
Medium	34	25.37
Pronounced	2	1.49
Total	134	----------
Temporal fullness:		
Small	20	15.38
Medium	103	79.23
Pronounced	7	5.38
Total	130	----------
Occipital protrusion:		
Absent	1	3.23
Small	9	29.03
Medium	20	64.52
Pronounced	1	3.23
Total	31	----------

Observations	Individuals	
	Number	Percent
Lambdoid flattening:		
Absent	2	6.67
Small	7	23.33
Medium	6	20.00
Pronounced	15	50.00
Total	30	----------
Occipital flattening:		
Absent	21	77.78
Medium	5	18.52
Pronounced	1	3.70
Total	27	----------
Body build:		
Linear	15	11.19
Medium	62	46.27
Lateral	57	42.54
Total	134	----------

TABLE 3.—*Otavalo group: Anthropometric measurements and indices*

Trait	Number	Range	Mean	P. E.	S. D.	P. E.	v	P. E.
Measurements:								
Stature	107	140–172 (c)	156.03	±0.37	5.64	±0.26	3.61	±0.17
Biacromial	108	28–45 (c)	36.23	±.13	2.04	±.09	5.63	±.26
Chest breadth	107	23–37 (c)	27.45	±.10	1.59	±.07	5.79	±.27
Chest depth	107	18–27 (c)	21.56	±.09	1.42	±.07	6.59	±.30
Sitting height	107	75–95 (c)	82.18	±.22	3.30	±.15	4.02	±.19
Head length	108	167–208 (m)	184.38	±.41	6.36	±.29	3.45	±.16
Head breadth	108	135–159 (m)	147.55	±.32	4.98	±.23	3.38	±.16
Head height	84	110–153 (m)	132.54	±.50	6.76	±.35	5.10	±.27
Minimum frontal	108	89–120 (m)	103.70	±.29	4.40	±.20	4.24	±.19
Bizygomatic	108	130–164 (m)	142.90	±.33	5.05	±.23	3.53	±.16
Bigonial	108	94–145 (m)	107.14	±.48	7.36	±.34	6.87	±.32
Total face height	108	105–144 (m)	120.25	±.38	5.85	±.27	4.86	±.22
Upper face height	108	55–79 (m)	68.05	±.30	4.60	±.21	6.76	±.31
Nose height	108	44–67 (m)	52.74	±.26	3.96	±.18	7.51	±.34
Nose breadth	108	31–57 (m)	38.57	±.23	3.60	±.17	9.33	±.43
Average	--------	----------	--------	--------	--------	--------	5.37	--------
Indices:								
Relative shoulder breadth	108	16–27	23.08	±.09	1.32	±.06	5.72	±.26
Thoracic index	107	65–92	78.54	±.35	5.32	±.25	6.77	±.31
Relative sitting height	107	48–57	52.56	±.11	1.64	±.08	3.12	±.14
Cephalic index	108	68–88	80.04	±.20	3.15	±.14	3.94	±.18
Length-height index	84	61–81	71.93	±.27	3.72	±.19	5.17	±.27
Breadth-height index	84	76–111	89.57	±.36	4.89	±.25	5.46	±.28
Fronto-parietal index	108	63–83	70.21	±.20	3.15	±.14	4.49	±.21
Cephalo-facial index	108	88–108	96.92	±.22	3.39	±.16	3.50	±.16
Zygo-frontal index	108	64–83	72.50	±.21	3.28	±.15	4.52	±.21
Fronto-gonial index	108	90–139	103.50	±.46	7.15	±.33	6.91	±.32
Zygo-gonial index	108	66–104	75.16	±.30	4.62	±.21	6.15	±.28
Facial index	108	70–94	84.20	±.29	4.40	±.20	5.23	±.24
Upper facial index	108	37–51	47.72	±.21	3.30	±.15	6.92	±.32
Nasal index	108	52–99	73.02	±.51	7.84	±.36	10.74	±.49
Average	--------	----------	--------	--------	--------	--------	5.57	--------

TABLE 4.—*Otavalo group: Morphological observations*

Observations	Individuals	
	Number	Percent
Marital state:		
Single	8	7.62
Married	94	89.52
Widow	3	2.86
Total	105	
Skin color; breast, inner arm:		
Brunet	3	2.83
Swarthy	8	7.55
Red brown	94	88.68
Light brown	1	.94
Total	106	
Vascularity:		
Absent	79	73.15
Small	22	20.37
Medium	7	6.48
Total	108	
Freckles:		
Absent	75	69.44
Small	24	22.22
Medium	3	2.78
Pronounced	1	.93
Massed	5	4.63
Total	108	
Moles:		
Absent	7	6.48
Few	78	72.22
Many	23	21.30
Total	108	
Hair, form:		
Straight	11	10.19
Low waves	70	64.81
Deep waves	27	25.00
Total	108	
Hair, texture:		
Coarse	44	40.74
Medium	63	58.33
Fine	1	.93
Total	108	
Head hair, quantity:		
Small	3	2.78
Medium	85	78.70
Pronounced	20	18.52
Total	108	
Baldness:		
Absent	100	92.59
Small	6	5.56
Medium	2	1.85
Total	108	
Beard, quantity:		
Slight	53	49.07
Small	47	43.52
Medium	8	7.41
Total	108	
Body hair:		
Absent	1	.93
Small	104	97.20
Medium	2	1.87
Total	107	
Grayness, head:		
Absent	96	88.89
Small	11	10.19
Pronounced	1	.93
Total	108	
Grayness, beard:		
Absent	89	82.41
Small	16	14.81
Medium	2	1.85
Pronounced	1	.93
Total	108	
Hair color, head:		
Black	100	92.59
Dark brown	7	6.48
Ash-gray	1	.93
Total	108	
Hair color, beard, mustache:		
Black	105	97.22
Dark brown	2	1.85
Ash	1	.93
Total	108	
Eye color:		
Black	73	67.59
Dark brown	33	30.56
Dark light brown	2	1.85
Total	108	

TABLE 4.—*Otavalo group: Morphological observations*—Continued

Observations	Individuals	
	Number	Percent
Iris:		
Clear	62	57.41
Rayed	24	22.22
Zoned	21	19.44
Spotted	1	.93
Total	108	
Eyefold, external:		
Absent	17	15.74
Small	22	20.37
Medium	44	40.74
Pronounced	25	23.15
Total	108	
Eyefold, median:		
Absent	14	12.96
Small	9	8.33
Medium	59	54.63
Pronounced	26	24.07
Total	108	
Eyefold, internal:		
Absent	26	24.07
Small	40	37.04
Medium	32	29.63
Pronounced	10	9.26
Total	108	
Eye, obliquity:		
Absent	30	27.78
Small	48	44.44
Medium	22	20.37
Pronounced	1	.93
Down	1	.93
Small and down	6	5.56
Total	108	
Eye, opening height:		
Small	70	64.81
Medium	38	35.19
Total	108	
Eyebrow, thickness:		
Small	49	45.37
Medium	57	52.78
Pronounced	2	1.85
Total	108	
Eyebrow, concurrency:		
Absent	45	41.67
Small	58	53.70
Medium	5	4.63
Total	108	
Brow ridges:		
Absent	1	0.93
Small	101	93.52
Medium	6	5.56
Total	108	
Forehead, height:		
Small	51	47.22
Medium	48	44.44
Pronounced	9	8.33
Total	108	
Forehead, slope:		
Small	48	44.44
Medium	56	51.85
Pronounced	4	3.70
Total	108	
Nasion depression:		
Slight	1	.93
Small	31	28.70
Medium	62	57.41
Pronounced	14	12.96
Total	108	
Nasal root, height:		
Small	5	4.63
Medium	74	68.52
Pronounced	29	26.85
Total	108	
Nasal root, breadth:		
Small	13	12.04
Medium	78	72.22
Pronounced	17	15.74
Total	108	
Nasal septum:		
Straight, concave	42	38.89
Convex	66	61.11
Total	108	
Nasal bridge, height:		
Small	3	2.78
Medium	77	71.30
Pronounced	28	25.93
Total	108	
Nasal bridge, breadth:		
Small	2	1.85
Medium	76	70.37
Pronounced	30	27.78
Total	108	

TABLE 4.—*Otavalo group: Morphological observations*—Continued

Observations	Individuals	
	Number	Percent
Chin, type:		
Median	35	32.71
Bilateral	72	67.29
Total	107	
Teeth, eruption:		
Complete	100	94.34
Partial	6	5.66
Total	106	
Teeth, bite:		
Under	5	4.76
Edge to edge	55	52.38
Small, over	34	32.38
Medium, over	11	10.48
Total	105	
Teeth, loss:		
None	42	38.89
Slight, 1-4	35	32.41
Small, 5-8	14	12.96
Medium, 9-16	8	7.41
Pronounced, 17+	9	8.33
Total	108	
Teeth, wear:		
Absent, small	20	18.87
Medium	33	31.13
Pronounced, very pronounced	53	50.00
Total	106	
Teeth, caries:		
Absent	2	1.92
Slight, 1-4	31	29.81
Small, 5-8	22	21.15
Medium, 9-16	19	18.27
Pronounced, 17+	30	28.85
Total	104	
Teeth, shortening:		
Absent	64	60.38
Small	26	24.53
Medium	15	14.15
Pronounced	1	.94
Total	106	
Teeth, crowding:		
Absent	14	13.33
Medium	72	68.57
Pronounced	19	18.10
Total	105	

Observations	Individuals	
	Number	Percent
Malars, front projection:		
Absent, small	4	3.70
Medium	33	30.56
Pronounced	71	65.74
Total	108	
Malars, lateral projection:		
Medium	24	22.22
Pronounced	84	77.78
Total	108	
Gonial angles:		
Small	1	.93
Medium	51	47.22
Pronounced	56	51.85
Total	108	
Ear, helix:		
Small	18	16.67
Medium	56	51.85
Pronounced	34	31.48
Total	108	
Ear, Darwin's point:		
Absent	71	65.74
Small	31	28.70
Medium	5	4.63
Pronounced	1	.93
Total	108	
Ear, lobe:		
Soldered	30	27.78
Attached	51	47.22
Free	27	25.00
Total	108	
Ear, size:		
Small	29	26.85
Medium	69	63.89
Pronounced	10	9.26
Total	108	
Ear, protrusion:		
Small	78	72.22
Medium	29	26.85
Pronounced	1	.93
Total	108	

TABLE 4.—*Otavalo group: Morphological observations*—Continued

Observations	Individuals	
	Number	Percent
Temporal fullness:		
Small	18	17.14
Medium	82	78.10
Pronounced	5	4.76
Total	105	
Nasal profile:		
Concave	18	16.67
Straight	45	41.67
Convex	24	22.22
Concavo-convex	21	19.44
Total	108	
Nasal tip, thickness:		
Small	8	7.41
Medium	63	58.33
Pronounced	36	33.33
Very pronounced	1	.93
Total	108	
Nasal tip, inclination:		
Up, medium	5	4.63
Up, small	50	46.30
Down, small	44	40.74
Down, medium	9	8.33
Total	108	
Nasal tip, wings:		
Compressed	14	12.96
Medium	70	64.81
Flaring	24	22.22
Total	108	
Nostrils visible, front:		
Absent	46	42.59
Small, medium	60	55.56
Pronounced	2	1.85
Total	108	
Nostrils visible, lateral:		
Absent	15	13.89
Present	93	86.11
Total	108	
Nostrils, shape:		
Thin	31	28.70
Medium	71	65.74
Round	6	5.56
Total	108	
Nostrils, axes:		
Parallel	1	.93
Oblique, small	10	9.26
Oblique, medium	51	47.22
Transverse	46	42.59
Total	108	
Lips, integumental:		
Small	22	20.37
Medium	46	42.59
Pronounced	40	37.04
Total	108	
Lips; membranous, upper:		
Small	29	26.85
Medium	57	52.78
Pronounced	22	20.37
Total	108	
Lips; membranous, lower:		
Small	14	12.96
Medium	61	56.48
Pronounced	32	29.63
Very pronounced	1	.93
Total	108	
Lips, eversion:		
Small	54	50.00
Medium	50	46.30
Pronounced	4	3.70
Total	108	
Lip, seam:		
Absent	5	4.63
Small	45	41.67
Medium	28	25.93
Pronounced	30	27.78
Total	108	
Midfacial prognathism:		
Absent	2	1.85
Small	67	62.04
Medium	35	32.41
Pronounced	4	3.70
Total	108	
Alveolar prognathism:		
Absent	1	.93
Small	39	36.11
Medium	58	53.70
Pronounced	10	9.26
Total	108	
Chin prominence:		
Small	34	31.48
Medium	72	66.67
Pronounced	2	1.85
Total	108	

TABLE 4.—*Otavalo group: Morphological observations*—Continued

Observations	Individuals		Observations	Individuals	
	Number	Percent		Number	Percent
Occipital protrusion:			Cranial asymmetry:		
Small	4	66.67	Absent	1	50.00
Medium	2	33.33	Left	1	50.00
Total	6	----------	Total	2	----------
Lambdoid flattening:			Facial asymmetry:		
Small	2	40.00	Absent	1	33.33
Medium	2	40.00	Left	2	66.67
Pronounced	1	20.00			
Total	5	----------	Total	3	----------
			Body build:		
Occipital flattening:			Linear	13	12.04
Absent	102	97.10	Medium	50	46.30
Medium	2	1.90	Lateral	45	41.67
Pronounced	1	.85			
Total	105	----------	Total	108	----------

TABLE 5.—*Angachagua group: Anthropometric measurements and indices*

Trait	Number	Range	Mean	P. E.	S. D.	P. E.	*v*	P. E.
Measurements:								
Stature	26	143-169 (c)	158.31	±0.71	5.34	±0.50	3.37	±0.32
Biacromial	26	31- 39 (c)	36.86	±.22	1.68	±.16	4.56	±.43
Chest breadth	26	26- 34 (c)	28.74	±.22	1.71	±.16	5.96	±.56
Chest depth	26	20- 29 (c)	24.42	±.24	1.78	±.17	7.29	±.68
Sitting height	26	78- 92 (c)	83.74	±.37	2.79	±.26	3.33	±.31
Head length	26	170-199 (m)	185.76	±.84	6.33	±.59	3.41	±.32
Head breadth	26	141-158 (m)	145.57	±.45	3.42	±.32	2.35	±.22
Head height	26	130-153 (m)	137.98	±.62	4.72	±.44	3.42	±.32
Minimum frontal	26	93-116 (m)	103.58	±.67	5.04	±.47	4.87	±.46
Bizygomatic	26	130-154 (m)	142.40	±.65	4.95	±.46	3.48	±.33
Bigonial	26	94-125 (m)	106.74	±.92	6.92	±.65	6.48	±.61
Total face height	26	100-134 (m)	119.50	±.81	6.10	±.57	5.10	±.48
Upper face height	26	55- 74 (m)	66.40	±.60	4.50	±.42	6.78	±.63
Nose height	26	44- 63 (m)	51.98	±.49	3.68	±.34	7.08	±.66
Nose breadth	25	31- 42 (m)	36.20	±.30	2.25	±.21	6.22	±.59
Average	---------	----------	--------	--------	--------	--------	4.91	--------
Indices:								
Relative shoulder breadth	26	22 -25	23.60	±.13	.98	±.09	4.21	±.39
Thoracic index	26	69-100	78.66	±.77	5.84	±.55	7.42	±.69
Relative sitting height	26	46- 55	52.80	±.22	1.64	±.15	3.11	±.29
Cephalic index	26	71- 88	80.07	±.44	3.30	±.31	4.12	±.39
Length-height index	26	70- 81	74.12	±.32	2.43	±.23	3.28	±.31
Breadth-height index	26	88-108	92.45	±.57	4.29	±.40	4.64	±.43
Fronto-parietal index	26	66- 77	69.64	±.37	2.79	±.26	4.01	±.38
Cephalo-facial index	26	91-102	95.81	±.25	2.70	±.25	2.82	±.26
Zygo-frontal index	26	68- 79	73.02	±.34	2.56	±.24	3.51	±.33
Fronto-gonial index	26	90-114	102.95	±.75	5.70	±.53	5.54	±.52
Zygo-gonial index	26	66- 86	75.19	±.56	4.20	±.39	5.59	±.52
Facial index	26	70- 94	83.15	±.74	5.80	±.52	6.73	±.63
Upper facial index	26	40- 54	46.76	±.45	3.42	±.32	7.31	±.68
Nasal index	25	56- 83	69.34	±.94	7.00	±.67	10.10	±.96
Average	---------	----------	--------	--------	--------	--------	5.17	--------

TABLE 6.—*Angachagua group: Morphological observations*

Observations	Individuals	
	Number	Percent
Marital state:		
Single	3	11.54
Married	22	84.62
Divorced	1	3.85
Total	26	
Skin color; beard, inner arm:		
Brunet	2	7.69
Swarthy	1	3.85
Red brown	20	76.92
Light brown	3	11.54
Total	26	
Vascularity:		
Absent	14	53.85
Small	10	38.46
Medium	2	7.69
Total	26	
Freckles:		
Absent	18	69.23
Small	8	30.77
Total	26	
Moles:		
Few	15	57.69
Many	11	42.31
Total	26	
Hair, form:		
Straight	14	53.85
Low waves	5	19.23
Deep waves	7	26.92
Total	26	
Hair, texture; coarse	26	100.00
Head hair, quantity:		
Small	2	7.69
Medium	8	30.77
Pronounced	16	61.54
Total	26	
Baldness:		
Absent	25	96.15
Small	1	3.85
Total	26	
Beard, quantity:		
Slight	7	26.92
Small	12	46.15
Medium	7	26.92
Total	26	
Body hair:		
Absent	1	3.85
Small	19	73.08
Medium	6	23.08
Total	26	
Grayness, head:		
Absent	23	92.00
Small	2	8.00
Total	25	
Hair color; head, black	26	100.00
Hair color; beard, mustache:		
Black	26	100.00
Eye, color:		
Black	9	34.62
Dark brown	17	65.38
Total	26	
Iris:		
Clear	14	53.85
Rayed	8	30.77
Zoned	4	15.38
Total	26	
Eyefold, external:		
Absent	5	19.23
Small	4	15.38
Medium	16	61.54
Pronounced	1	3.85
Total	26	
Eyefold, median:		
Absent	1	3.85
Small	4	15.38
Medium	18	69.23
Pronounced	3	11.54
Total	26	
Eyefold, internal:		
Absent	2	7.69
Small	14	53.85
Medium	8	30.77
Pronounced	2	7.69
Total	26	
Eye, obliquity:		
Absent	7	26.92
Small	3	11.54
Medium	14	53.85
Down and small	1	3.85
Down and absent	1	3.85
Total	26	

TABLE 6.—*Angachagua group: Morphological observations*— Continued

Observations	Individuals	
	Number	Percent
Eye, opening height:		
Small	16	61.54
Medium	10	38.46
Total	26	
Eyebrow, thickness:		
Small	5	19.23
Medium	18	69.23
Pronounced	3	11.54
Total	26	
Eyebrow, concurrency:		
Absent	7	26.92
Small	15	57.69
Medium	4	15.38
Total	26	
Brow ridges:		
Small	23	88.46
Medium	3	11.54
Total	26	
Forehead, height:		
Small	9	34.62
Medium	17	65.38
Total	26	
Forehead, slope:		
Small	8	30.77
Medium	14	53.85
Pronounced	4	15.38
Total	26	
Nasion depression:		
Small	4	15.38
Medium	15	57.69
Pronounced	7	26.92
Total	26	
Nasal root, height:		
Small	2	7.69
Medium	19	73.08
Pronounced	5	19.23
Total	26	
Nasal root, breadth:		
Small	3	11.54
Medium	23	88.46
Total	26	

Observations	Individuals	
	Number	Percent
Nasal septum:		
Straight, concave	11	42.31
Convex	15	57.69
Total	26	
Nasal bridge, height:		
Medium	16	61.54
Pronounced	10	38.46
Total	26	
Nasal bridge, breadth:		
Small	2	7.69
Medium	19	73.08
Pronounced	5	19.23
Total	26	
Nasal profile:		
Concave	5	19.23
Straight	9	34.62
Convex	7	26.92
Concavo-convex	5	19.23
Total	26	
Nasal tip, thickness:		
Small	4	15.38
Medium	20	76.92
Pronounced	2	7.69
Total	26	
Nasal tip, inclination:		
Up, small	13	50.00
Down, small	11	42.31
Down, medium	2	7.69
Total	26	
Nasal tip, wings:		
Compressed	6	23.08
Medium	19	73.08
Flaring	1	3.85
Total	26	
Nostrils, visibility front:		
Absent	11	42.31
Small, medium	15	57.69
Total	26	
Nostrils, visibility lateral:		
Thin	2	7.69
Medium	24	92.31
Total	26	

TABLE 6.—*Angachagua group: Morphological observations*—Continued

Observations	Individuals	
	Number	Percent
Nostrils, shape:		
Thin	11	42.31
Medium	13	50.00
Round	2	7.69
Total	26	
Nostrils, axes:		
Oblique, small	2	7.69
Oblique, medium	15	57.69
Transverse	9	34.62
Total	26	
Lips, integumental:		
Small	3	11.54
Medium	3	11.54
Pronounced	20	76.92
Total	26	
Lips, membranous, upper:		
Small	4	15.38
Medium	17	65.38
Pronounced	5	19.23
Total	26	
Lips, lower:		
Small	2	7.69
Medium	12	46.15
Pronounced	12	46.15
Total	26	
Lips, eversion:		
Small	7	26.92
Medium	18	69.23
Pronounced	1	3.85
Total	26	
Lips, seam:		
Small	13	50.00
Medium	8	30.77
Pronounced	5	19.23
Total	26	
Midfacial prognathism:		
Small	19	73.08
Medium	7	26.92
Total	26	
Alveolar prognathism:		
Small	9	34.62
Medium	16	61.34
Pronounced	1	3.85
Total	26	
Chin, prominence:		
Small	12	46.15
Medium	14	53.85
Total	26	
Chin, type:		
Median	9	34.62
Bilateral	17	65.38
Total	26	
Teeth, eruption:		
Complete	17	65.38
Partial	9	34.62
Total	26	
Teeth, bite:		
Edge to edge	19	73.08
Small over	7	26.92
Total	26	
Teeth, loss:		
None	13	50.00
Slight, 1–4	7	26.92
Small, 5–8	1	3.85
Medium, 9–16	1	3.85
Pronounced, 17+	4	15.38
Total	26	
Teeth, wear:		
Absent, small	6	23.08
Medium	9	34.62
Pronounced	11	42.31
Total	26	
Teeth, caries:		
Slight, 1–4	11	42.31
Small, 5–8	3	11.54
Medium, 9–16	4	15.38
Pronounced, 17+	8	30.77
Total	26	
Teeth, shortening:		
Absent	18	69.23
Small	4	15.38
Medium	3	11.54
Pronounced	1	3.85
Total	26	
Teeth, crowding:		
Absent	5	19.23
Medium	18	69.23
Pronounced	3	11.54
Total	26	

TABLE 6.—*Angachagua group: Morphological observations*—Continued

Observations	Individuals	
	Number	Percent
Molars projection, front:		
Medium	9	34.62
Pronounced	17	65.38
Total	26	----------
Molars, lateral projection:		
Small	1	3.85
Medium	7	26.92
Pronounced	18	69.23
Total	26	----------
Gonial angle:		
Small	5	19.23
Medium	6	23.08
Pronounced	15	57.69
Total	26	----------
Ear, helix:		
Small	9	34.62
Medium	11	42.31
Pronounced	6	23.08
Total	26	----------
Ear, antihelix:		
Small	7	26.92
Medium	15	57.69
Pronounced	4	15.38
Total	26	----------
Darwin's point:		
Absent	14	53.85
Small	8	30.77
Medium	3	11.54
Pronounced	1	3.85
Total	26	----------
Ear, lobe:		
Soldered	10	38.46
Attached	9	34.62
Free	7	26.92
Total	26	----------
Ear, size:		
Small	7	26.92
Medium	16	61.54
Pronounced	3	11.54
Total	26	----------
Ear, protrusion:		
Small	20	76.92
Medium	5	19.23
Pronounced	1	3.85
Total	26	----------
Temporal fullness:		
Small	2	8.00
Medium	21	84.00
Pronounced	2	8.00
Total	25	----------
Occipital protrusion:		
Absent	1	4.00
Small	5	20.00
Medium	18	72.00
Pronounced	1	4.00
Total	25	----------
Lambdoid flattening:		
Absent	2	8.00
Small	5	20.00
Medium	4	16.00
Pronounced	14	56.00
Total	25	----------
Occipital flattening:		
Absent	19	86.36
Medium	3	13.64
Total	22	----------
Body build:		
Linear	2	7.69
Medium	12	46.15
Lateral	12	46.15
Total	26	----------

TABLE 7.—*Differences of Angachagua over Otavalo indices and measurements, with values in terms of × P. E.*[1]

Trait	Difference	×P. E.
Measurements:		
Stature	+2.28	2.85
Biacromial	+.63	2.31
Sitting height	+1.56	3.55
Head length	+1.38	1.47
Head breadth	−1.98	3.60
Head height	+5.44	5.89
Minimum frontal	−.12	.16
Bizygomatic	−.50	.68
Bigonial	−.40	.38
Total face height	−.75	.84
Upper face height	−1.65	2.46
Nose height	−.76	1.36
Nose breadth	−2.37	6.41
Indices:		
Relative shoulder breadth	+0.52	3.47
Thoracic index	+.12	.14
Relative sitting height	+.24	1.00
Cephalic index	+.03	.06
Length-height index	+2.19	5.21
Breadth-height index	+2.88	4.30
Fronto-parietal index	−.57	1.36
Cephalo-facial index	−1.11	3.36
Zygo-frontal index	+.52	1.30
Fronto-gonial index	−.55	.62
Zygo-gonial index	+.03	.05
Facial index	−1.05	1.33
Upper facial index	−.96	1.92
Nasal index	−3.68	3.44

[1] Percentage of measurements under 3×P. E.=69; percentage of indices under 3×P. E.=64.

TABLE 8.—*Comparison of means for measurements and indices of Imbabura Indians with those of Quichua and Aymara Indians of Bolivia measured by Chervin*[1]

Trait	Imbabura[2] (column A)	Bolivian Quichua (column B)	Bolivian Aymara (column C)
Number in series	133–4	66–67	111
Measurements:			
Stature	1,564 (m)	1,580 (m)	1,570 (m)
Sitting height	824 (m)	840 (m)	870 (m)
Head length	185 (m)	182 (m)	183 (m)
Head breadth	148 (m)	147 (m)	150 (m)
Head height (110 cases)	134 (m)	134 (m)	130 (m)
Bizygomatic	143 (m)	138 (m)	142 (m)
Indices:			
Cephalic index	80	82	82
Length-height index	72	73	69
Breadth-height index	90	87	89
Relative sitting height	53	52	54

[1] Chervin, 1907–08, vol. 2.

[2] Round numbers.

TABLE 9.—*Differences of male Indians of the Province of Imbabura (including all measurements from Otavalo, Agato, San Roqué, and Angachagua) and male Quichua Indians measured in Bolivia by Chervin, calculated by means of the putative method* [1]

Trait	Difference [2]	P. E.	XP. E.
Measurements:			
Stature	−1.52	±0.57	2.67
Sitting height	−1.52	±.33	4.61
Head length	+2.65	±.65	4.08
Head breadth	+.76	±.46	1.65
Head height	−.18	±.71	.25
Bizygomatic	+4.80	±.51	9.41
Indices:			
Cephalic index	−1.96	±.32	6.12
Length-height index	−.56	±.37	1.51
Breadth-height index	+3.26	±.51	6.39
Relative sitting height	+.60	±.17	3.53

[1] Percentage of measurements below 4XP. E.=50; percentage of indices below 4XP. E.=50.

[2] Differences calculated from actual values; cf. table 1.

TABLE 10.—*Differences between male Indians of the Province of Imbabura (including all measurements from Otavalo, San Roqué, Angachagua) and male Aymara Indians measured in Bolivia by Chervin,*[1] *calculated by means of the putative method* [2]

Trait	Differences	P. E.	XP. E.
Measurements:			
Stature	−0.52	±0.49	1.06
Sitting height	−4.52	±.28	16.14
Head length	+1.65	±.55	3.00
Head breadth	−2.24	±.40	5.60
Head height	+3.82	±.61	6.26
Bizygomatic	+.80	±.44	1.82
Indices:			
Cephalic index	−1.96	±.28	7.00
Length-height index	+3.44	±.33	10.42
Breadth-height index	+1.26	±.44	2.86
Relative sitting height	−1.40	±.14	10.00

[1] Differences calculated from actual values; cf. table 1.

[2] Percentage of measurements below 4XP. E.=50; percentage of indices below 4XP. E.=25.

Table 11.—*Differences between the Otavalo group and male Quichuas of Bolivia measured by Chervin, calculated by means of the putative method* [1]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	−1.97	±0.60	3.28
Sitting height	−1.82	±.35	5.20
Head length	+2.38	±.67	3.55
Head breadth	+.55	±.52	1.06
Head height	−1.46	±.75	1.95
Bizygomatic	+4.90	±.54	9.07
Indices:			
Cephalic index	−1.96	±.33	5.94
Length-height index	−1.07	±.44	2.43
Breadth-height index	+2.57	±.55	4.67
Relative sitting height	+.56	±.18	3.11

[1] Percentage of measurements below 4×P. E.=67; percentage of indices below 4×P. E.=50.

Table 12.—*Differences between the Otavalo group and male Aymaras of Bolivia measured by Chervin, calculated by means of the putative method* [1]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	−0.97	±0.52	1.87
Sitting height	−4.82	±.30	16.07
Head length	+1.38	±.58	2.38
Head breadth	−2.45	±.45	5.44
Head height	+2.54	±.66	3.85
Bizygomatic	.90	±.46	1.96
Indices:			
Cephalic index	−1.96	±.28	7.00
Length-breadth index	+2.93	±.36	8.14
Breadth-height index	+.57	±.48	1.19
Relative sitting height	−1.44	±.15	9.60

[1] Percentage of measurements below 4×P. E.=67; percentage of indices below 4×P. E.=25.

TABLE 13.—*Comparison of means for measurements and indices of Imbabura Indians with those of Quichua and Aymara Indians measured in Bolivia by Rouma, in millimeters in round numbers* [1]

Trait	Imbabura Quichua (column A, No. 134)	Bolivia Quichua (column B, No. 245)	Bolivia Aymara (column C, No. 52)
Measurements:			
Stature	1,564	1,601	1,599
Biacromial	363	365	362
Chest breadth	-----	-----	-----
Chest depth	-----	-----	-----
Sitting height	825	852	850
Head length	185	181	180
Head breadth	148	148	148
Head height	134	126	129
Minimum frontal	101	109	111
Bizygomatic	143	141	140
Bigonial	107	104	103
Total face height	120	(2)	-----
Upper face height	-----	-----	-----
Nose height	52.6	48.6	50.4
Nose breadth	38.1	35.3	35.5
Indices:			
Relative shoulder breadth	23.12	22.7	22.7
Thoracic index	-----	-----	-----
Cephalic index	80.04	81.5	81.7
Length-height index	72.44	69.5	71.7
Breadth-height index	90.26	84.9	87.9
Fronto-parietal index	70.12	-----	-----
Cephalo-facial index	-----	-----	-----
Zygo-frontal index	-----	-----	-----
Fronto-gonial index	-----	-----	-----
Zygo-gonial index	75.16	73.7	73.7
Facial index	-----	-----	-----
Upper face index	-----	-----	-----
Nasal index	72.34	73.2	71.2
Relative sitting height	52.60	53.2	53.1

[1] Rouma, G., 1933. The Quichua series is composed of 10 groups of men measured in the following localities: Tarabuco, Chaqui, Puna, Vacas, Colomi, Punata, Novillero, Potolo, Anfaya, and Caraza, in the Departments of Chuquisaca, Cochabamba, and Potosi. The Aymara series is composed of 2 groups of males measured in Cañaviri and Pillapi of the Department of La Paz.

[2] Measured from hair line, not comparable.

TABLE 14.—*Differences between the whole Imbabura group and Quichua Indians measured in Bolivia by Rouma, with value in terms of probable error, calculated by the putative method* [1]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	−3.62	±0.41	8.83
Biacromial	+.15	±.15	1.00
Sitting height	−2.72	±.24	11.33
Head length	+3.65	±.47	7.77
Head breadth	−.24	±.30	.80
Head height	+7.82	±.52	15.04
Minimum frontal	−7.66	±.33	23.21
Bigonial	+3.06	±.52	5.88
Nose height	+3.98	±.29	13.72
Nose breadth	+2.85	±.26	10.96
Bizygomatic	+1.80	±.36	5.00
Indices:			
Relative shoulder breadth	+.42	±.09	4.67
Cephalic index	−1.46	±.24	6.08
Length-height index	+2.94	±.27	10.89
Breadth-height index	+5.36	±.37	14.49
Zygo-gonial index	+1.46	±.40	3.65
Relative sitting height	−.60	±.12	5.00
Nasal index	−.86	±.57	1.51

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[1] Percentage of measurements under 4×P. E.=18 percent; percentage of indices under 4×P. E.=29 percent.

TABLE 15.—*Differences between the whole Imbabura group and Aymara Indians measured in Bolivia by Rouma, with value in terms of probable error, calculated by the putative method* [1]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	−3.42	±0.62	5.52
Biacromial	+.15	±.22	.68
Sitting height	−2.52	±.36	7.00
Head length	+4.65	±.71	6.55
Head breadth	−.24	±.52	.46
Head height	+4.82	±.76	6.34
Minimum frontal	−9.66	±.51	18.94
Bizygomatic	+2.80	±.55	5.09
Bigonial	+4.06	±.80	5.07
Nose height	+2.18	±.44	4.95
Nose breadth	+2.65	±.44	6.02
Indices:			
Relative shoulder breadth	+.42	±.13	3.23
Cephalic index	−1.66	±.36	4.61
Length-height index	+.74	±.41	1.80
Breadth-height index	+2.36	±.56	4.21
Zygo-gonial index	+1.46	±.71	2.06
Nasal index	+1.14	±.86	1.33
Relative sitting height	−.50	±.18	2.78

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[1] Percentage of measurements under 4×P. E.=18; percentage of indices under 4×P. E.=71.

TABLE 16.—*Differences between the Otavalo group and Quichua Indians of Bolivia measured by Rouma, with value in terms of probable error, calculated by the putative method* [1]

Trait	Difference	P. E.	XP. E.
Measurements:			
Stature	−3.98	±0.44	9.05
Biacromial	−.27	±.16	1.69
Sitting height	−3.02	±.26	11.62
Head length	+3.38	±.49	6.90
Head breadth	−.45	±.39	1.15
Head height	+6.54	±.57	11.47
Minimum frontal	−5.30	±.35	15.14
Bizygomatic	+1.90	±.40	4.75
Bigonial	+3.14	±.57	5.51
Nose height	+4.14	±.31	13.35
Nose breadth	+3.27	±.28	11.68
Indices:			
Cephalic index	−1.46	±.24	6.08
Length-height index	+2.43	±.31	7.84
Breadth-height index	+4.67	±.41	11.39
Zygo-gonial index	+1.46	±.36	4.06
Nasal index	−.18	±.61	.29
Relative sitting height	−.64	±.13	4.92

[1] Percentage of measurements under 4×P. E.=18; percentage of indices under 4×P. E.=17.

TABLE 17.—*Differences between Otavalo group and Aymara Indians of Bolivia measured by Rouma, with value in terms of probable error, calculated by the putative method* [1]

Trait	Difference	P. E.	XP. E.
Measurements:			
Stature	−1.87	±0.65	5.95
Biacromial	+.03	±.23	.13
Sitting height	−2.82	±.37	7.62
Head length	+4.38	±.72	6.08
Head breadth	−.45	±.57	.79
Head height	+3.54	±.81	4.37
Minimum frontal	−7.30	±.50	14.60
Bizygomatic	+4.14	±.84	4.93
Nose height	+2.34	±.45	5.20
Nose breadth	+3.07	±.41	7.49
Indices:			
Cephalic index	−1.66	±.35	4.74
Length-height index	+.23	±.45	.51
Breadth-height index	+1.67	±.58	2.88
Zygo-gonial index	+1.46	±.52	2.81
Nasal index	+1.82	±.89	2.01
Relative sitting height	−.54	±.19	2.84

[1] Percentage of measurements below 4×P. E.=20; percentage of indices below 4×P. W.=83.33.

TABLE 18.—*Comparison of means for measurements and indices of Imbabura Indians with those of Quichua and Machiganga Indians of Peru studied by Ferris in millimeters in round numbers*[1]

Trait	Imbabura Quichua (column A, No. 134)	Peruvian Quichua (column B, No. 124)	Peruvian Quichua (column C, No. 85)	Peruvian Machiganga (column D, No. 18)
Measurements:				
Stature	1,565	1,584	1,584	1,559
Biacromial	363	381	-----------	-----------
Chest breadth	277	-----------	304	275
Chest depth	217	-----------	224	218
Sitting height	825	836	830	781
Head length	185	185	190	181
Head breadth	148	148	150	145
Head height	134	146	134	128
Minimum frontal	101	-----------	-----------	-----------
Bizygomatic	143	141	141	141
Bigonial	107	104	-----------	-----------
Total face height	120	116	[2] 135	[2] 125
Upper face height	68	65	-----------	-----------
Nose height	52.6	-----------	57	50
Nose breadth	38.1	-----------	40	42
Indices:				
Relative shoulder breadth	23.12	24.0	-----------	-----------
Relative sitting height	52.60	51.8	52.54	50.09
Thoracic index	78.58	-----------	73.83	79.38
Cephalic index	80.04	79.9	79.46	80.38
Length-height index	72.44	68.6	70.46	70.9
Breadth-height index	90.26	-----------	-----------	-----------
Fronto-parietal index	70.12	-----------	-----------	-----------
Cephalo-facial index	96.71	-----------	-----------	-----------
Zygo-gonial index	75.16	73.5	-----------	-----------
Facial index	84.00	82.9	[2] 96.35	[2] 88.44
Upper facial index	47.54	45.9	-----------	-----------
Nasal index	72.34	-----------	69.98	85.37

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[1] The data in column B are from H. B. Ferris (1921), and comprise the pure Quichuas only, measured by Dr. L. T. Nelson, from the localities mentioned in pp. 62–63 of Ferris' work. The data in column C are from Ferris (1916), and refer to Indians measured by Dr. D. E. Ford in the Provinces of Urubamba and Convención of the Department of Cuzco. They comprise supposedly pure Quichuas, although the author states that there is a possibility of 8 percent admixture with Spanish whites. Data in column D are from Ferris (1921), and refer to Indians measured by Dr. Ford in the San Miguel Valley.

[2] Probably glabella-menton height.

TABLE 19.—*Differences between whole Imbabura group and Quichua series 1 reported from Peru by Ferris, with value in terms of probable error, calculated by putative method* [1] [2]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	−1.92	±0.47	4.09
Biacromial	−1.65	±.17	9.71
Sitting height	−1.12	±.28	4.00
Head length	−.35	±.54	.65
Head breadth	−.24	±.40	.60
Head height	−12.18	±.59	20.64
Bizygomatic	+1.80	±.42	4.29
Bigonial	+3.06	±.61	5.02
Total face height	+4.10	±.50	8.20
Upper face height	+2.75	±.39	7.05
Indices:			
Relative shoulder breadth	−.88	±.10	8.80
Relative sitting height	+.80	±.14	5.71
Cephalic index	+.14	±.27	.52
Length-height index	+3.84	±.32	12.00
Zygo-gonial index	+1.66	±.50	3.32
Facial index	+1.10	±.39	2.82
Upper facial index	+1.64	±.28	5.86

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[1] Percentage of measurements below 4×P. E.=20; percentage of indices below 4×P. E.=43.

[2] See table 18, column B.

TABLE 20.—*Differences between whole Imbabura group and Quichua Indians series 2 reported from Peru by Ferris, with value in terms of probable error, calculated by putative method* [1] [2]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	−1.92	±0.53	3.62
Chest breadth	−2.71	±.16	16.94
Chest depth	−.66	±.14	4.71
Sitting height	−.52	±.31	1.68
Head length	−5.35	±.60	8.92
Head breadth	−2.24	±.44	5.09
Head height	−.18	±.65	.28
Bizygomatic	+1.80	±.47	3.83
Total face height	−14.90	±.55	27.09
Nose height	−4.42	±.37	11.95
Nose breadth	−1.85	±.33	5.61
Indices:			
Relative sitting height	+.06	±.16	.37
Thoracic index	+4.75	±.50	9.50
Cephalic index	+.58	±.30	1.93
Length-height index	+1.98	±.35	5.66
Facial index	−12.35	±.44	28.07
Nasal index	+2.36	±.73	3.23

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[1] Percentage of measurements under 4×P. E.=36; percentage of indices under 4×P. E.=50.

[2] See table 18, column C.

TABLE 21.—*Differences between whole Imbabura group and Machiganga Indians reported from Peru by Ferris, with value in terms of probable error, calculated by putative method* [1] [2]

Trait	Difference	P. E.	× P. E.
Measurements:			
Stature	+0.58	±0.96	0.60
Chest breadth	+ .19	± .29	.66
Chest depth	− .06	± .26	.23
Sitting height	+4.38	± .56	7.82
Head length	+3.65	±1.09	3.35
Head breadth	+2.76	± .80	3.45
Head height	+5.82	±1.16	5.02
Bizygomatic	+1.80	± .85	2.12
Total face height	−4.90	±1.00	4.90
Nose height	+2.58	± .66	3.91
Nose breadth	−3.85	± .60	6.42
Indices:			
Relative sitting height	+2.51	± .28	8.96
Thoracic index	− .80	± .92	.87
Cephalic index	− .34	± .55	.62
Length-height index	+1.54	± .62	2.48
Facial index	−4.44	± .80	5.55
Nasal index	−13.03	±1.26	10.34

[1] Percentage of measurements under 4×P. E.=63; percentage of indices under 4×P. E.=50.

[2] See table 18, column D.

TABLE 22.—*Differences between male Otavalo and Quichua Indians of Peru reported by Ferris (column B, table 18), series 1, with value in terms of probable error calculated by putative method* [1]

Trait	Difference	P. E.	× P. E.
Measurements:			
Stature	−2.37	±0.50	4.74
Biacromial	−1.87	± .18	10.39
Sitting height	−1.42	± .30	4.73
Head length	− .62	± .56	1.11
Head breadth	− .45	± .44	1.02
Head height	−13.46	± .65	20.71
Bizygomatic	1.90	± .45	4.22
Bigonial	3.14	± .66	4.76
Total face height	4.25	± .52	8.17
Upper face height	3.05	± .41	7.44
Indices:			
Relative shoulder breadth	− .92	± .12	7.67
Relative sitting height	− .76	± .15	5.07
Zygo-gonial index	1.66	± .41	4.05
Cephalic index	.14	± .28	.50
Length-height index	3.33	± .36	9.25
Facial index	1.30	± .40	3.25

[1] Percentage of measurements below 4×P. E.=20; percentage of indices below 4×P. E.= 33.

TABLE 23.—*Differences between Otavalo group and Quichua Indians, series 2, reported from Peru by Ferris, with value in terms of probable error, calculated by putative method* [1]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	−2.37	±0.55	4.31
Chest breadth	−2.95	±.16	18.44
Chest depth	−.84	±.13	6.46
Sitting height	−.82	±.33	2.48
Head length	−5.62	±.62	9.06
Head breadth	−2.45	±.48	5.10
Head height	−1.46	±.70	2.09
Bizygomatic	+1.90	±.50	3.80
Total face height	−14.75	±.57	25.88
Nose height	−4.26	±.37	11.51
Nose breadth	−1.43	±.35	4.09
Indices:			
Length-height index	+1.47	±.39	3.79
Relative sitting height	−.02	±.16	.12
Cephalic index	+.58	±.30	1.93
Facial index	−12.16	±.44	27.64
Nasal index	+3.04	±.76	4.00
Thoracic index	+4.71	±.30	1.93

[1] Percentage of measurements below 4×P. E.=27; percentage of indices below 4×P. E.=67.

TABLE 24.—*Differences between Otavalo group and Machiganga of Peru reported by Ferris, with value in terms of probable error, calculated by putative method* [1]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	+0.13	±0.97	0.13
Chest breadth	−.05	±.27	.19
Chest depth	−.24	±.25	.96
Sitting height	+4.08	±.57	7.16
Head length	+3.38	±1.09	3.10
Head breadth	+2.25	±.85	3.00
Head height	+4.52	±1.19	3.80
Bizygomatic	+1.90	±.87	2.18
Total face height	−4.75	±1.00	4.75
Nose height	+2.74	±.68	4.03
Nose breadth	−3.43	±.62	5.53
Indices:			
Relative sitting height	+2.47	±.28	8.82
Thoracic index	−.84	±.92	.91
Cephalic index	−.34	±.54	.63
Facial index	−4.24	±.75	5.65
Nasal index	−12.35	±1.35	9.15
Length-height index	+1.03	±.65	1.58

[1] Percentage of measurements under 4×P. E.=64; percentage of indices under 4×P. E.=50.

TABLE 25.—*Comparison of means of measurements and indices of male Imbabura Indians and Cayapas Indians measured by Barrett, in millimeters*[1]

Trait	Imbabura (column A, series No. 134)	Cayapas (column B, series No. 36)
Measurements:		
Stature	1,564.8	1,551.31
Sitting height	824.8	836.84
Biacromial	363.5	399.21
Head length	184.65	178.36
Head breadth	147.76	148.94
Bizygomatic	142.80	139.89
Face height	120.10	111.21
Measurements—Continued.		
Nose height	52.58	46.68
Nose breadth	38.15	36.42
Indices:		
Relative sitting height	52.60	53.88
Facial index	84.00	79.59
Nasal index	72.34	78.46
Cephalic index	80.04	83.58

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[1] Barrett, 1925, vol. 2, p. 423.

TABLE 26.—*Differences between total Imbabura series and male Cayapas of the Ecuadorean coast measured by Barrett, with value in terms of probable error, computed by putative method*[1]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	+1.35	±0.72	1.87
Sitting height	−1.20	±.41	2.93
Biacromial	−3.57	±.25	14.28
Head length	+6.29	±.81	7.77
Head breadth	−1.18	±.59	2.00
Bizygomatic	+2.91	±.64	4.55
Face height	+8.89	±.74	12.01
Nose height	+5.90	±.50	11.80
Nose breadth	+1.73	±.45	3.84
Indices:			
Relative sitting height	−1.28	±.21	6.10
Facial index	+4.41	±.59	7.47
Nasal index	−6.12	±.90	6.80
Cephalic index	−3.54	±.41	8.63

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[1] Percentage of measurements under 4×P. E.=44; percentage of indices under 4×P. E.=0.

TABLE 27.—*Differences between male Otavalo and male Cayapas of Ecuadorean coast measured by Barrett, with value in terms of probable error, calculated by putative method* [1]

Trait	Difference	P. E.	XP. E.
Measurements:			
Stature	+0.72	±0.73	0.99
Sitting height	−1.50	±.44	3.41
Biacromial	−3.69	±.26	14.19
Head length	+6.02	±.82	7.37
Head breadth	−1.39	±.65	2.14
Bizygomatic	+3.01	±.66	4.56
Face height	+9.04	±.76	11.89
Nose height	+6.06	±.52	11.65
Nose breadth	+2.15	±.46	4.67
Indices:			
Relative sitting height	−1.32	±.21	6.29
Facial index	+4.61	±.57	8.09
Nasal index	−5.44	±1.01	5.39
Cephalic index	−3.54	±.40	8.85

[1] Percentage of measurements below 4×P. E.=33; percentage of indices below 4×P. E.=0.

TABLE 28.—*Comparison of means for whole Imbabura group with those of Piro, Machiyenga, and Sipibo of eastern Peru reported by Farabee* [1]

Trait	Imbabura[2] (column A, series No. 134)	Piro (column B, series No. 23)	Macheyenga (column C, series No. 19)	Sipibo (column D, series No. 14)
Measurements:				
Stature	1,564	1,613	1,610	1,586
Sitting height	824	866	832	797
Biacromial	363	379	406	381
Chest breadth	277	283	293	292
Chest depth	217	237	234	235
Head length	185	194	184	182
Head breadth	148	150	146	156
Head height	134	134	134	135
Bizygomatic	143	145	145	147
Total face height	120	118	112	122
Nose height	53	48	50	48
Nose breadth	38	41	40	41
Minimum frontal	101	121	121	124
Bigonial	107	127	119	128
Indices:				
Relative sitting height	52.60	53.77	51.10	50.97
Thoracic index	78.58	83.87	80.20	78.58
Cephalic index	80.01	77.43	78.99	85.69
Length-height index	72.44	----------	----------	----------
Breadth-height index	90.26	89.71	92.50	86.82
Facial index	84.00	81.45	77.50	82.88
Nasal index	72.34	86.59	80.10	84.63

[1] Farabee, 1922, pp. 168–179.

[2] Round numbers.

TABLE 29.—*Differences between total Imbabura group and Piro Indians reported by Farabee, with value in terms of probable error, calculated by putative method* [1]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	−4.82	0.87	5.54
Sitting height	−4.12	.50	8.24
Biacromial	−1.55	.30	5.17
Chest breadth	−.61	.26	2.35
Chest depth	−1.96	.24	8.17
Head length	−9.35	.97	9.64
Head breadth	−2.24	.71	3.15
Head height	−.18	1.04	.17
Bizygomatic	−2.20	.77	2.86
Total face height	3.10	.89	2.36
Nose height	4.85	.60	7.63
Nose breadth	−2.58	.53	5.38
Minimum frontal	−19.66	.69	28.49
Bigonial	−19.94	1.10	18.13
Indices:			
Relative sitting height	−1.17	.25	4.68
Thoracic index	−5.29	.82	6.45
Cephalic index	2.61	.49	5.33
Breadth-height index	.55	.75	.73
Facial index	2.55	.71	3.59
Nasal index	−14.25	1.19	11.97

[1] Percentage of measurements below 4×P. E.=36; percentage of indices below 4×P. E.=33.

TABLE 30.—*Differences between total Imbabura group and Arawak Machiyenga reported by Farabee, with value in terms of probable error, calculated by putative method* [1]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	−4.52	0.94	4.81
Sitting height	−.72	.54	1.33
Biacromial	−4.25	.33	12.88
Chest breadth	−1.61	.29	5.55
Chest depth	−1.66	.26	6.38
Head length	.65	1.06	.61
Head breadth	1.76	.78	2.26
Head height	−.18	1.14	.16
Bizygomatic	−2.20	.83	2.65
Total face height	8.10	.97	8.35
Nose height	2.58	.65	3.97
Nose breadth	−1.85	.58	3.19
Minimum frontal	−19.66	.76	26.21
Bigonial	−11.94	1.20	9.95
Indices:			
Relative sitting height	1.50	.27	5.56
Thoracic index	−1.62	.90	1.80
Cephalic index	1.05	.53	1.98
Breadth-height index	−2.24	.82	2.73
Facial index	6.50	.78	8.33
Nasal index	−7.76	1.30	5.97

[1] Percentage of measurements below 4×P. E.=36; percentage of indices below 4×P. E.=50.

TABLE 31.—*Differences between whole Imbabura group and Pano Sipibo Indians reported by Farabee, with value in terms of probable error, calculated by putative method* [1]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	−2. 12	±1. 07	1. 98
Sitting height	2. 78	±. 61	4. 56
Biacromial	−1. 75	±. 37	4. 73
Chest breadth	−1. 51	±. 33	4. 58
Chest depth	−1. 76	±. 29	6. 07
Head length	2. 65	±1. 21	2. 19
Head breadth	−8. 24	±. 89	9. 26
Head height	−1. 18	±1. 29	. 91
Bizygomatic	−4. 20	±. 95	4. 42
Total face height	−1. 90	±1. 11	1. 71
Nose height	4. 58	±. 75	6. 11
Nose breadth	−2. 85	±. 66	4. 32
Minimum frontal	−22. 60	±. 87	26. 05
Bigonial	−20. 94	±1. 37	15. 28
Indices:			
Relative sitting height	1. 63	±. 32	5. 09
Thoracic	0	±1. 02	0
Cephalic	−5. 65	±. 60	9. 42
Breadth-height	3. 44	±. 93	3. 70
Facial	1. 12	±. 89	1. 26
Nasal	−12. 29	±1. 48	8. 30

[1] Percentage of measurements below 4×P. E.=29; percentage of indices below 4×P. E.=50.

TABLE 32.—*Differences between Otavalo group and Arawak Piro measured in eastern Peru by Farabee, with value in terms of probable error, calculated by putative method* [1]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	−5. 27	±0. 87	6. 06
Sitting height	−4. 42	±. 51	8. 67
Biacromial	−1. 67	±. 32	5. 22
Chest breadth	−. 85	±. 24	3. 54
Chest depth	−2. 14	±. 22	9. 73
Head length	−9. 62	±. 98	9. 82
Head breadth	−2. 45	±. 77	3. 18
Bizygomatic	−2. 10	±. 78	2. 69
Total face height	+2. 25	±. 91	2. 47
Nose height	+4. 74	±. 66	7. 18
Nose breadth	−2. 43	±. 58	4. 19
Head height	−1. 46	+1. 07	1. 36
Bigonial	−19. 86	±1. 14	17. 42
Nasal	−13. 57	±1. 21	11. 21
Indices:			
Minimum frontal index	−17. 30	±. 69	25. 10
Relative sitting height	−1. 21	±. 25	4. 89
Thoracic index	−5. 33	±. 82	6. 50
Cephalic index	+2. 61	±. 44	5. 93
Breadth-height index	−. 14	±. 78	. 06
Facial index	+2. 75	±. 69	3. 99

[1] Percentage of measurements below 4×P. E.=36; percentage of indices below 4×P. E.=33.

Table 33.—*Differences between Otavalo males and Arawak Machiyenga males measured by Farabee in eastern Peru with value in terms of probable error, calculated by putative method*[1]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	−4.97	±0.94	5.28
Sitting height	−1.02	±.56	1.82
Biacromial	−4.37	±.35	12.48
Chest breadth	−1.85	±.28	6.60
Chest depth	−1.84	±.22	8.36
Head length	+0.38	±1.06	.35
Head breadth	+1.55	±.84	1.85
Head height	−1.46	±1.16	1.26
Bizygomatic	−2.10	±.85	2.47
Total face height	+8.25	±.97	8.50
Nose height	+2.74	±.71	3.86
Nose breadth	−1.43	±.61	2.34
Minimum frontal	−17.30	±.73	23.70
Bigonial	−11.86	±1.23	9.64
Indices:			
Relative sitting height	+1.46	±.27	5.42
Thoracic index	−1.66	±.89	1.87
Cephalic index	+1.05	±.53	1.98
Breadth-height index	−2.93	±.83	3.53
Facial index	+6.70	±.73	9.18
Nasal index	−7.08	±1.31	5.40

[1] Percentage of measurements under 4×P. E.=50; percentage of indices under 4×P. E.=50.

Table 34.—*Differences between Otavalo and Pano Sipibo measured in Peru by Farabee, with value in terms of probable error, calculated by putative method*[1]

Trait	Difference	P. E.	×P. E.
Measurements:			
Stature	−2.57	±1.08	2.38
Sitting height	+2.48	±.64	3.87
Biacromial	−1.87	±.39	4.79
Chest breadth	−1.75	±.30	5.83
Chest depth	−1.94	±.28	6.93
Head length	+3.38	±1.22	1.95
Head breadth	−8.45	±.95	8.89
Head height	−2.46	±1.32	1.86
Bizygomatic	−4.10	±.97	4.23
Total face height	−1.75	±1.12	1.56
Nose height	+4.74	±.79	6.00
Nose breadth	−2.43	±.78	3.11
Bigonial	−20.86	±1.41	14.48
Minimum frontal	−20.30	±.84	24.19
Indices:			
Relative sitting height	+1.59	±.32	4.97
Thoracic index	−.04	±1.02	.00
Cephalic index	−5.56	±.60	.94
Breadth height index	+2.65	±.95	2.89
Facial index	+1.32	±.84	1.57
Nasal index	−11.61	±1.50	7.74

[1] Percentage of measurements below 4×P. E.=43; percentage of indices below 4×P. E.=67.

TABLE 35.—*Measurements and indices reported by Steggerda on Maya Indians of Yucatan* [1]

Trait	Mean	S. D.	×P. E.
Measurements:			
Stature	155.11±.40	5.25±.29	3.38±.18
Sitting height	83.67±.28	2.96±.20	3.54±.24
Chest breadth	28.05±.13	1.39±.09	4.96±.33
Chest depth	20.55±.12	1.22±.08	5.94±.40
Biacromial	30.01±.14	1.51±.10	3.97±.27
Head length	180.41±.41	5.33±.29	2.95±.16
Head breadth	153.71±.36	4.64±.25	3.02±.17
Head height	117.50±.37	3.91±.26	3.33±.22
Bizygomatic	142.98±.49	5.14±.35	3.59± 24
Minimum frontal	110.86±.44	4.58±.31	4.13±.28
Bigonial	106.06±.53	5.54±.37	5.22±.35
Nose height	55.78±.30	3.14±.21	5.63±.38
Nose breadth	38.22±.24	2.51±.17	6.57±.44
Face height	118.48±.64	6.58±.45	5.64±.38
Indices:			
Relative sitting height	53.02±.11	1.14±.08	2.15±.15
Thoracic index	(2)	(2)	(2)
Relative shoulder breadth	24.28±.08	0.80±.06	3.29±.22
Cephalic index	85.01±.22	2.80±.16	3.29±.18
Nasal index	68.50±.57	5.95±.40	8.28±.57
Facial index	82.46±.37	3.90±.26	4.73±.32

[1] Steggerda, 1932.

[2] Not comparable.

TABLE 36.—*Differences between whole Imbabura group and Maya group reported by Steggerda, with values in terms of probable error, calculated by regular and by putative methods*

Trait	Regular method			Putative method		
	Difference	P. E.	×P. E.	Difference	P. E.	×P. E.
Measurements:						
Stature	1.37	±0.52	2.63	1.37	±0.55	2.49
Sitting height	−1.19	±.33	3.61	−1.19	±.36	3.31
Chest breadth	−.36	±.16	2.00	−.36	±.19	1.89
Chest depth	1.19	±.15	7.93	1.19	±.17	7.00
Biacromial	6.34	±.18	35.22	6.34	±.22	28.22
Head length	3.24	±.55	5.89	3.24	±.60	5.31
Head breadth	−5.95	±.46	12.93	−5.95	±.45	13.22
Head height	16.32	±.57	28.63	16.32	±.77	21.19
Minimum frontal	−9.52	±.52	18.31	−9.52	±.51	18.67
Bizygomatic	−.18	±.57	.32	−.18	±.56	.32
Bigonial	1.00	±.68	1.47	1.00	±.81	1.23
Total face height	1.64	±.73	2.25	1.64	±.66	2.48
Nose height	−3.20	±.37	8.65	−3.20	±.44	7.27
Nose breadth	−.07	±.32	.22	−.07	±.39	.18
Indices:						
Relative shoulder breadth	−1.16	±.11	10.55	−1.16	±.14	8.29
Relative sitting height	−.42	±.15	2.80	−.42	±.19	2.21
Cephalic index	−4.97	±.29	17.14	−4.97	±.31	16.03
Facial index	1.54	±.46	3.35	1.54	±.53	2.91
Nasal index	3.84	±.73	5.26	3.84	±.87	4.41
Average			8.90			7.74

TABLE 37.—*Differences between Otavalo males and male Mayas measured by Steggerda in Yucatan* [1]

Trait	Regular method		
	Difference	P. E.	×P. E.
Measurements:			
Stature	+0.92	±0.55	1.69
Sitting height	−1.49	±.36	4.14
Chest breadth	−.60	±.16	3.75
Chest depth	+1.01	±.15	6.31
Biacromial	+6.32	±.19	32.74
Head length	+2.97	±.58	5.12
Head breadth	−6.16	±.49	12.57
Head height	+15.04	±.62	24.26
Minimum frontal	−7.16	±.53	13.51
Bizygomatic	−.08	±.59	.14
Bigonial	+1.08	±.60	1.80
Total face height	+1.79	±.74	2.42
Nose height	−3.04	±.35	8.68
Nose breadth	+.35	±.33	1.06
Indices:			
Relative shoulder breadth	−1.20	±.12	10.00
Relative sitting height	−.46	±.16	2.88
Cephalic index	−4.97	±.30	16.57
Facial index	+1.74	±.47	3.70
Nasal index	+4.52	±.76	5.95

[1] Percentage of measurements under 3×P. E.=36; percentage of indices under 3×P. E.=20.

TABLE 38.—*Percentages of insignificant differences, as shown by putative × P. E. under 4, between total Imbabura group and various foreign groups*

Group	Percentage under 4×P. E.			
	Measurements		Indices	
	Rank	Percent	Rank	Percent
1. Expected differences in random samples of same universe	----------	99.38	----------	99.38
2. Imbabura compared with Chervin Quichua (table 9)	2	50.00	2	50.00
3. Imbabura compared with Rouma Quichuas (table 14)	8	18.18	6	28.57
4. Imbabura compared with Ferris Quichuas (table 19)	7	20.00	3	42.86
5. Imbabura compared with Ferris Quichuas (table 20)	4	36.36	2	50.00
6. Imbabura compared with Chervin Aymaras (table 10)	2	50.00	7	25.00
7. Imbabura compared with Rouma Aymaras (table 15)	8	18.18	1	71.42
8. Imbabura compared with Barrett Cayapas (table 26)	3	44.44	8	----------
9. Imbabura compared with Ferris Machiganga (table 21)	1	63.64	2	50.00
10. Imbabura compared with Farabee Machiyenga (table 30)	2	50.00	2	50.00
11. Imbabura compared with Farabee Sipibo (table 31)	6	28.57	2	50.00
12. Imbabura compared with Farabee Piro (table 29)	5	35.71	5	33.33
13. Imbabura compared with Steggerda Maya (table 36)	2	50.00	4	40.00

TABLE 39.—*Distribution of differences as expressed by × P. E., calculated by putative method, between total Imbabura group and respective apposite series.*

Group	Distribution of × P. E. in categories of size by percentages							Percentage below 3 × P. E.	Percentage below 4 × P. E.	Rank
	1	2	3	4	5	6	7			
1. Expected difference in random samples of same universe[1]	50.00	17.73	4.30	0.698	0.074	0.005	0.0002	95.70	99.38	....
2. Imbabura compared with Chervin Quichuas (table 9)	10.00	20.00	10.00	10.00	20.00	0	30.00	40.00	50.00	2
3. Imbabura compared with Rouma Quichuas (table 14)	5.56	11.11	.00	5.56	5.56	16.69	55.56	16.57	22.22	10
4. Imbabura compared with Ferris Quichuas (table 19)	17.65	0	5.88	5.88	17.65	17.65	35.29	23.53	29.41	9
5. Imbabura compared with Ferris Quichuas (table 20)	11.76	11.76	.00	17.65	5.88	17.65	35.29	23.53	41.18	4
6. Imbabura compared with Chervin Aymaras (table 10)	.00	20.00	10.00	10.00	.00	10.00	50.00	30.00	40.00	5
7. Imbabura compared with Rouma Aymaras (table 15)	11.11	11.11	11.11	5.56	16.63	16.67	27.78	33.33	38.89	6
8. Imbabura compared with Barrett Cayapas (table 26)	0	7.69	15.38	7.69	0.69	0	61.54	23.08	30.77	8
9. Imbabura compared with Ferris Machiganga (table 21)	29.41	0	11.76	17.65	5.88	11.76	23.53	41.18	58.82	1
10. Imbabura compared with Farabee Machiyenga (table 30)	10.00	15.00	15.00	10.00	5.00	15.00	30.00	40.00	50.00	2
11. Imbabura compared with Farabee Sipibo (table 31)	10.00	15.00	5.00	5.00	25.00	5.00	35.00	30.00	35.00	7
12. Imbabura compared with Farabee Piro (table 29)	10.00	0	15.00	10.00	5.00	20.00	40.00	25.00	35.00	7
13. Imbabura compared with Steggerda Maya (table 36)	10.53	5.26	21.05	10.53	.00	10.53	42.11	36.84	47.37	3

[1] From Mathematical Tables from Handbook of Chemistry and Physics, 5th ed., p. 183, Cleveland, 1936.

TABLE 40.—*Percentage of insignificant differences between Otavalo group and various foreign groups as shown by × P. E. under 4 in round numbers*

Group	Percentage under 4 × P. E.				Measurements and indices	
	Measurements		Indices			
	Rank	Percent	Rank	Percent	Rank	Percent
1. Expected differences in random sample of same universe		99.38		99.38		
2. Otavalo compared with Chervin Quichuas (table 11)	1	67	3	50	1	60
3. Otavalo compared with Rouma Quichuas (table 16)	8	18	7	17	10	18
4. Otavalo compared with Ferris Quichuas table (22)	7	20	5	33	8	25
5. Otavalo compared with Ferris Quichuas (table 23)	6	27	2	67	6	41
6. Otavalo compared with Chervin Aymaras (table 12)	1	67	6	25	3	50
7. Otavalo compared with Rouma Aymaras (table 17)	7	20	1	83	4	44
8. Otavalo compared with Barrett Cayapas (table 27)	5	33	8	0	9	23
9. Otavalo compared with Ferris Machiganga (table 24)	2	64	3	50	2	59
10. Otavalo compared with Farabee Machiyenga (table 33)	3	50	3	50	3	50
11. Otavalo compared with Farabee Sipibo (table 34)	4	43	2	67	3	50
12. Otavalo compared with Farabee Piro (table 32)	5	36	4	33	7	35
13. Maya (table 37)	4	43	4	40	5	42

TABLE 41.—*Percentages of insignificant differences between Otavalo, whole Imbabura group, and Maya, as shown by × P. E. under 3*

Group	Percentage under 3 × P. E.	
	Measurements	Indices
1. Angachagua compared with Otavalo (table 7)	69	64
2. Imbabura compared with Maya, regular method (table 36)	43	20
3. Imbabura compared with Maya, putative method (table 36)	43	40
4. Otavalo compared with Maya, regular method (table 37)	36	20

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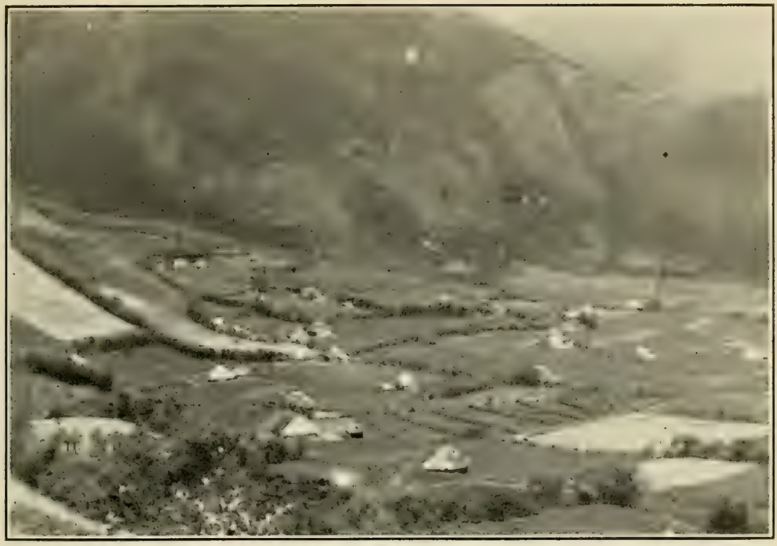
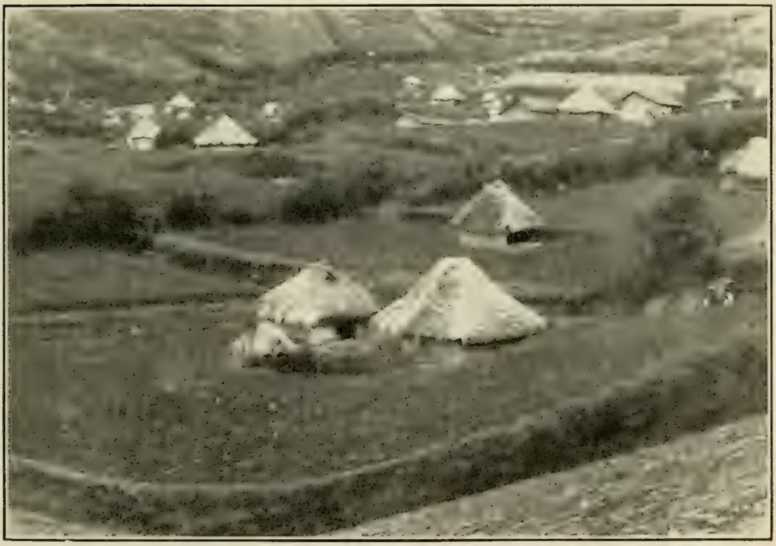
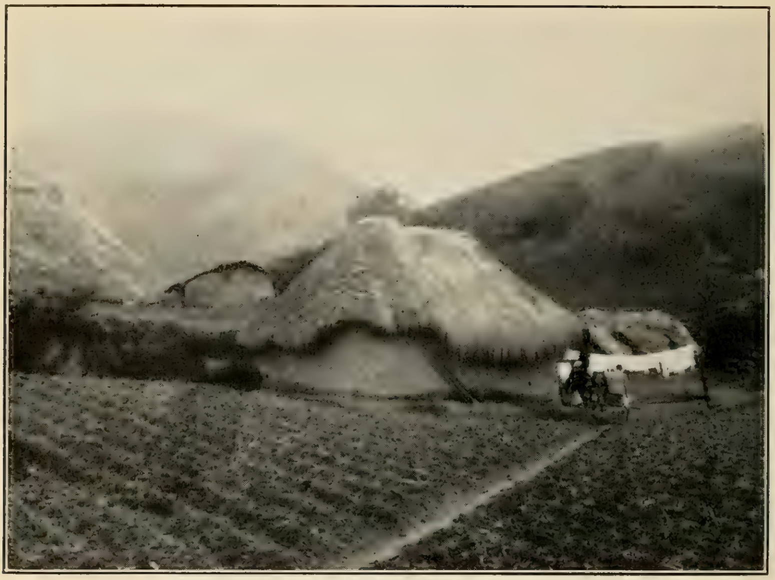


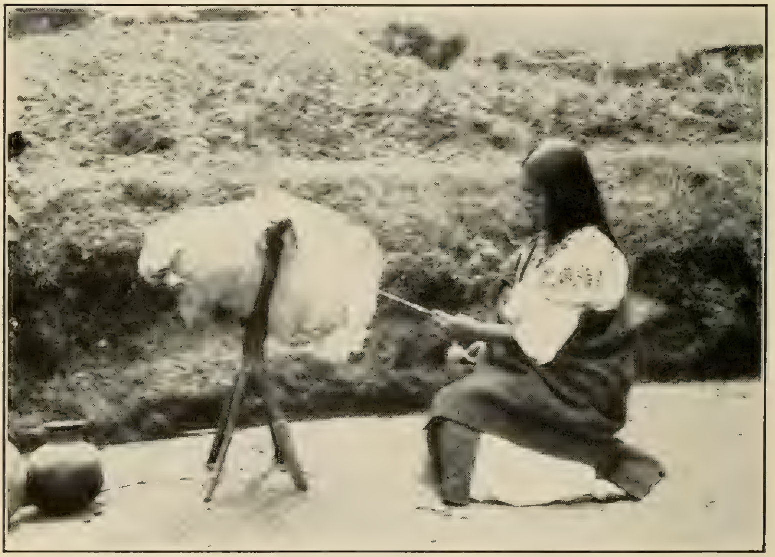
1. GENERAL VIEW OF THE VILLAGE OF ANGACHAGUA.



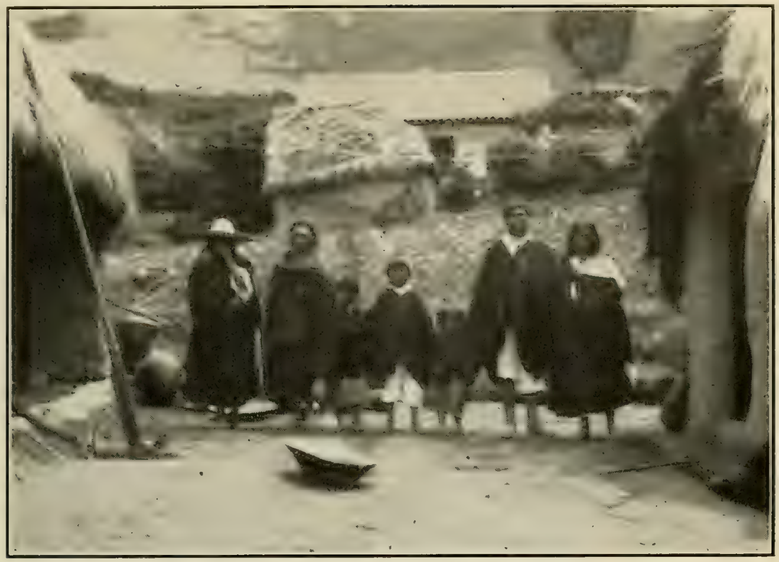
2. HOUSES AND FIELDS AT ANGACHAGUA. NOTE FOUR-SIDED ROOF CONSTRUCTION.



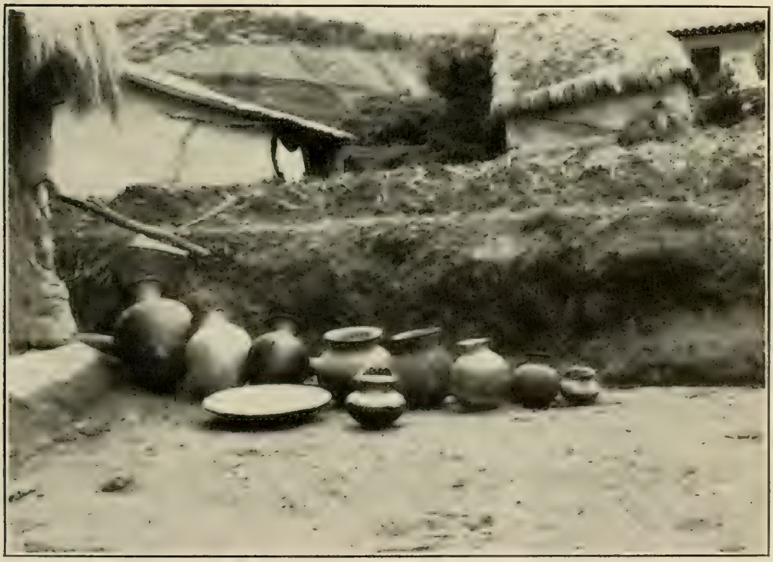
1. House at Angachagua.



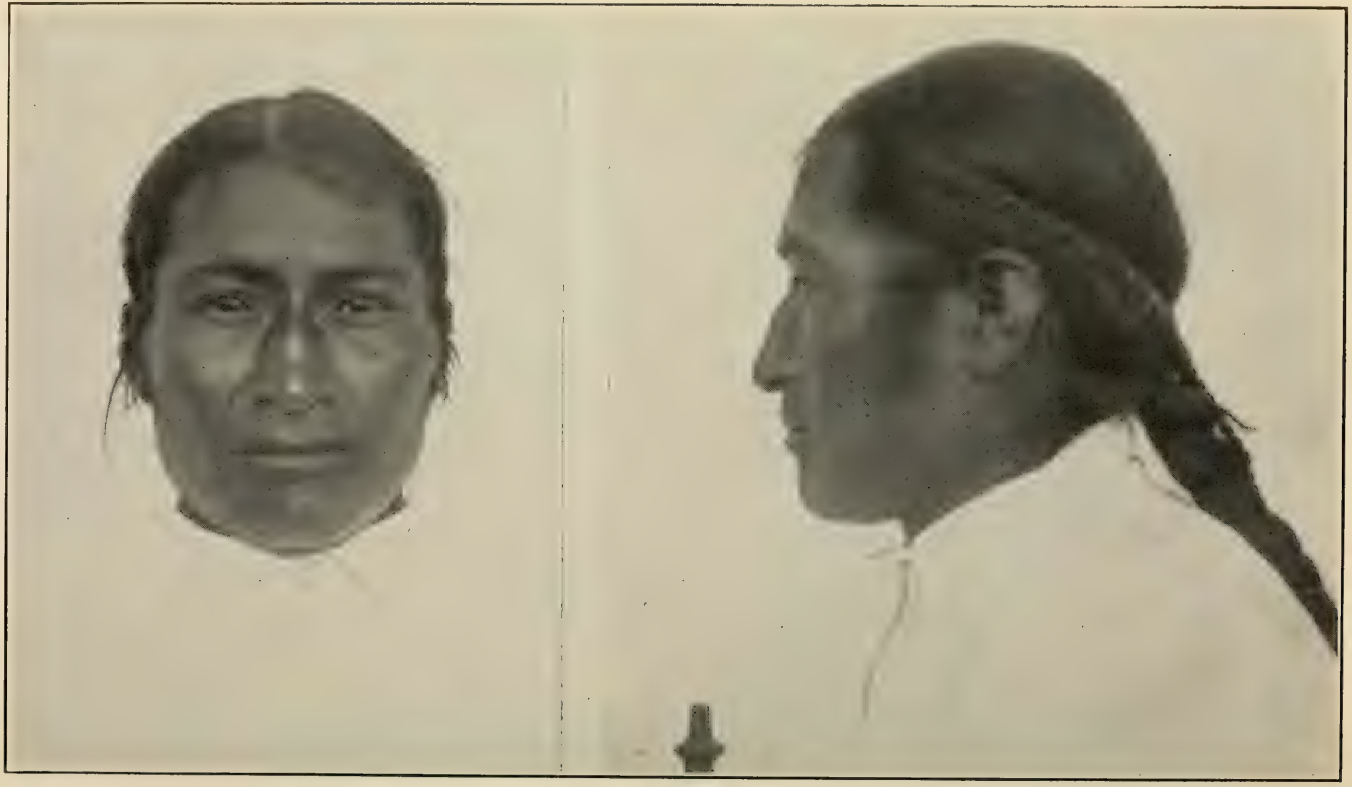
2. Quichua Indian Woman Spinning Wool, Angachagua.



1. NATIVE QUICHUA INDIANS OF ANGACHAGUA, SHOWING TYPICAL COSTUME.



2. HOUSEHOLD UTENSILS: POTTERY VESSELS.



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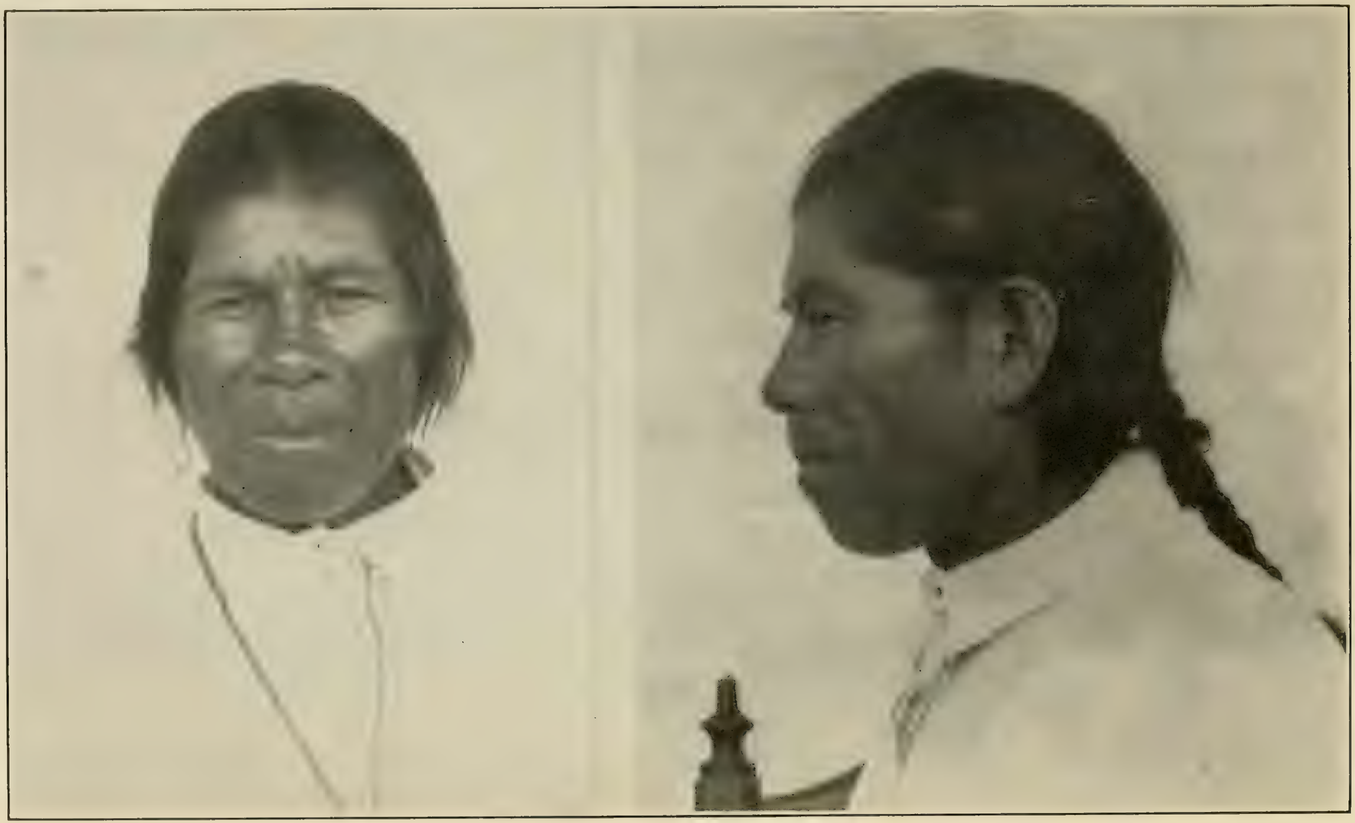

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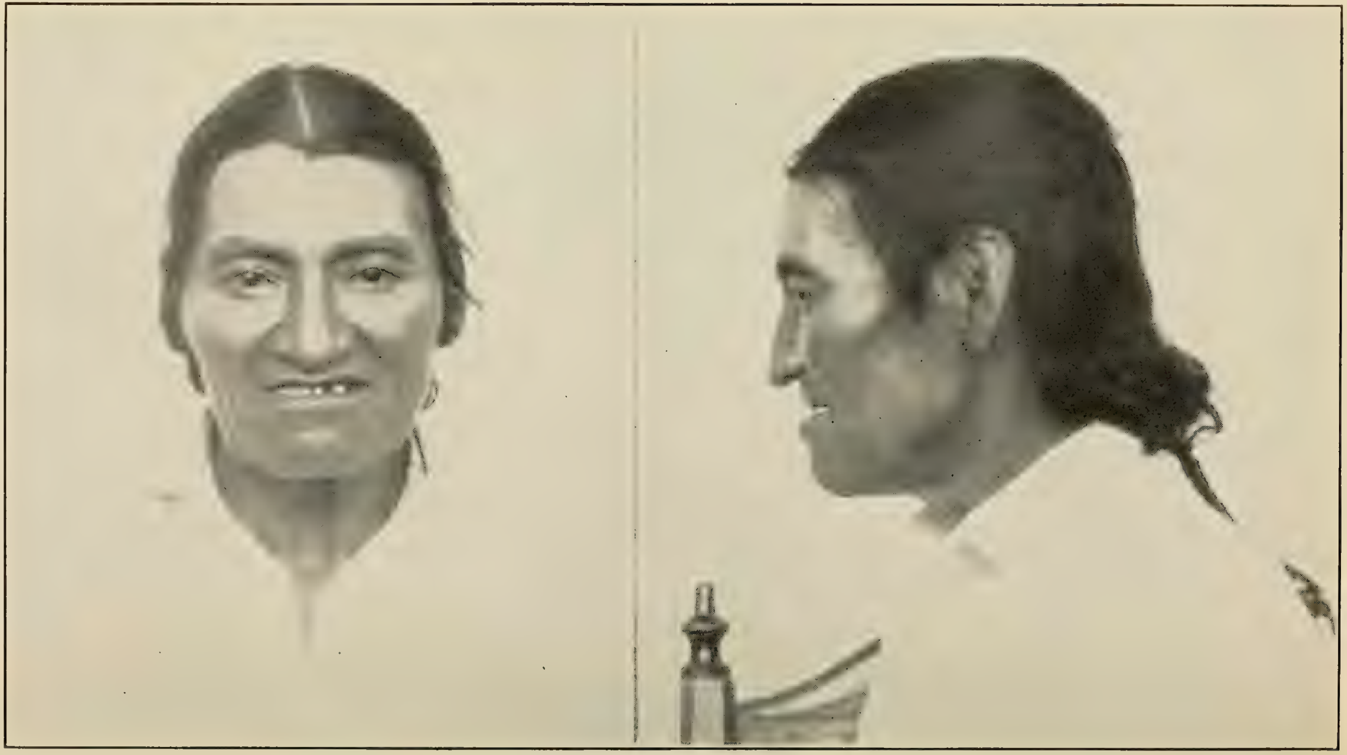

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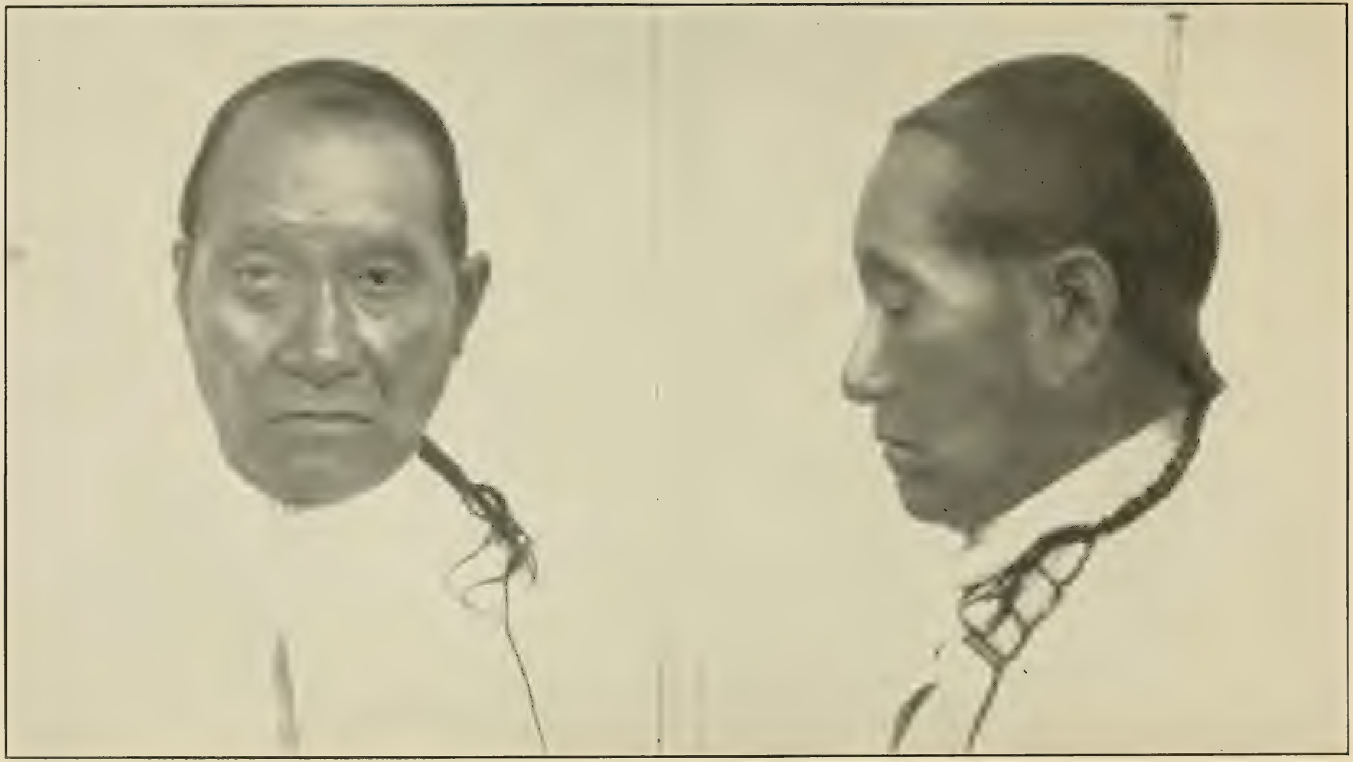

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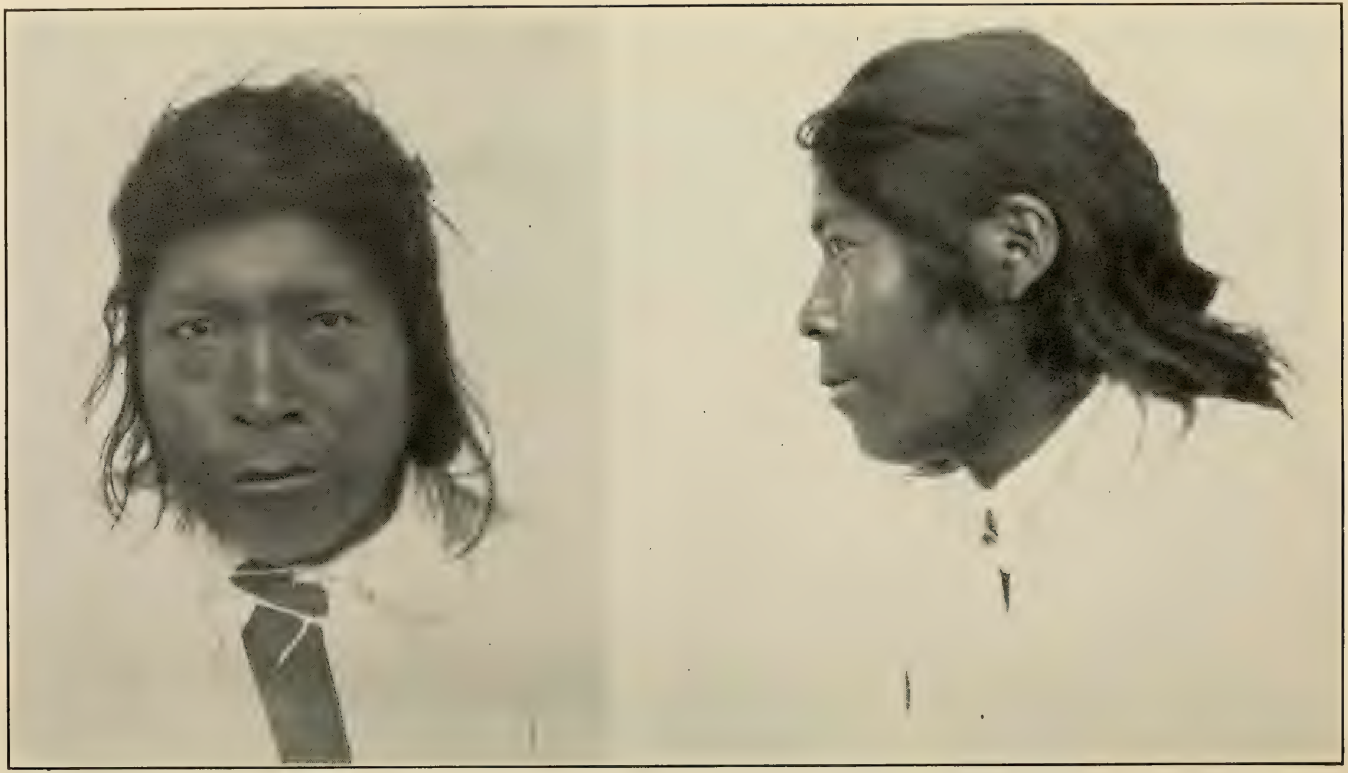

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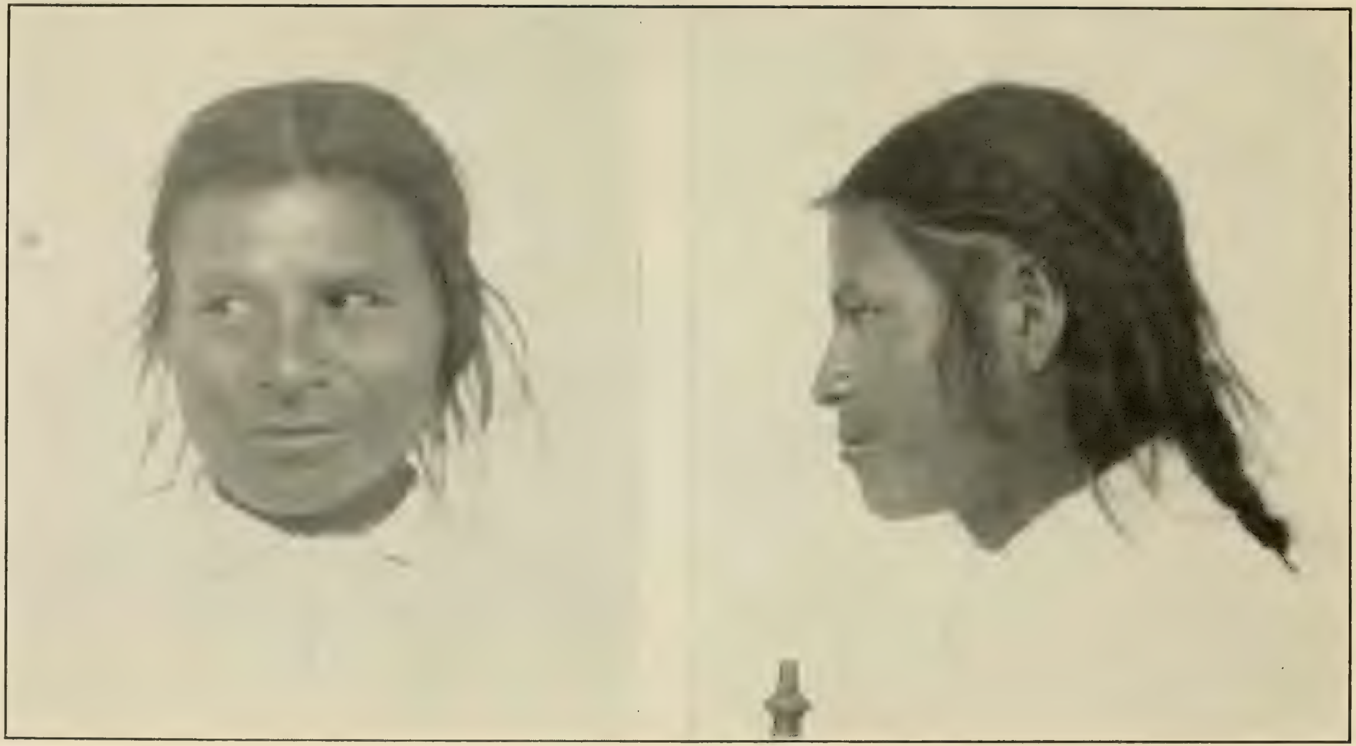

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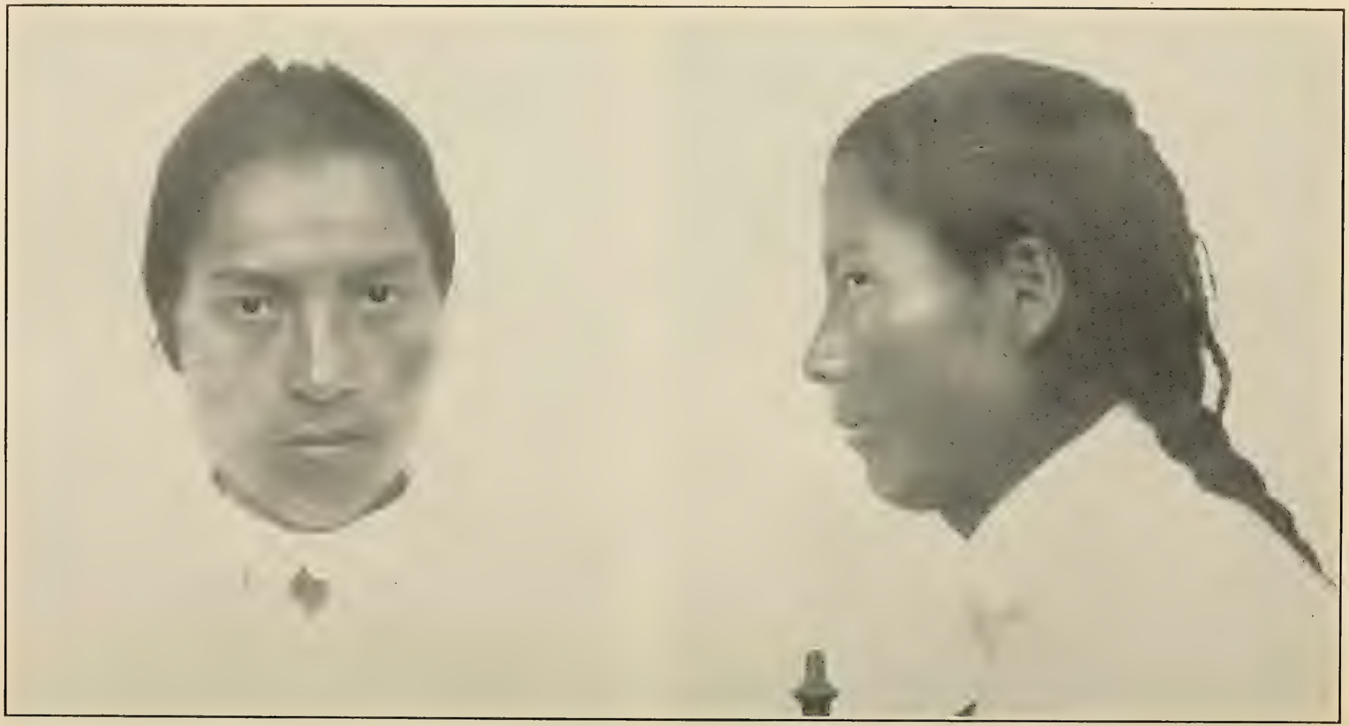

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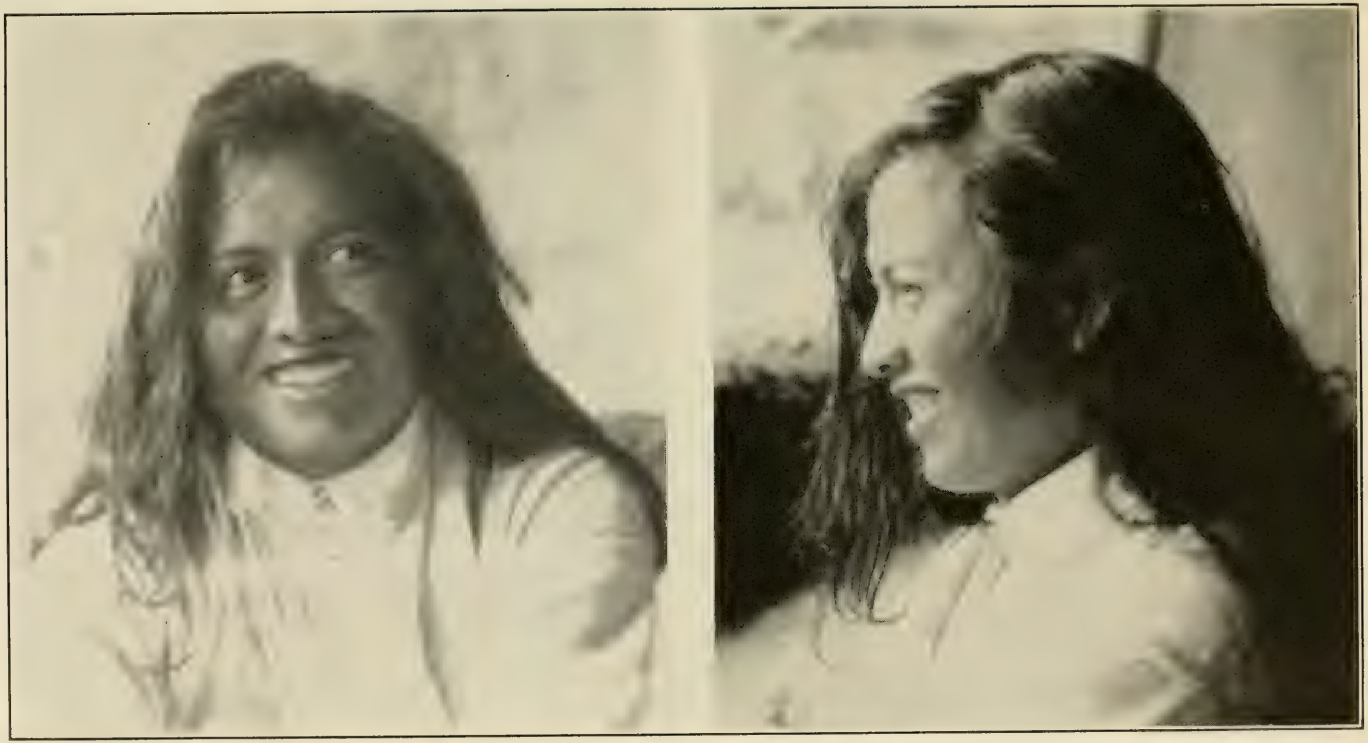

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Art Processes in Birchbark of the River Desert Algonquin, a Circumboreal Trait

By FRANK G. SPECK

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ART PROCESSES IN BIRCHBARK OF THE RIVER DESERT ALGONQUIN, A CIRCUMBOREAL TRAIT

BY FRANK G. SPECK

INTRODUCTION

Knowledge of the area over which birchbark basketry is used and decorated in northeastern America has now been extended to include a wide area in the Province of Quebec, from the Ottawa River northward to the St. Maurice, Lake Barrier, and Grand Lake Victoria. This is the territory inhabited by various bands forming the quondam Algonquin Nation, now widely dispersed throughout the Canadian forest region of the upper Ottawa from the River du Lièvre on the east, taking in the Gatineau, Coulonge, and Dumoine Rivers, west to Lake Timiskaming and the frontier between Quebec and Ontario. A series of specimens of birchbark work from five bands of this historically famous group are to be found in the collections of a number of museums (as listed below), and seem sufficient to justify reproduction and discussion of the designs they offer as representing the work of the Algonquin proper. The specimens, numbering over 130, forming the original basis of this study, with locations and other pertinent data,[1] are as follows:

a. River Desert Band:
- The National Museum of Canada (NMC),[2] 37 specimens, collected (1915–18) by E. Sapir and F. G. Speck.
- The Museum of the American Indian, Heye Foundation (MAI), 41 specimens, collected (1926–29) by F. G. Speck.
- The University Museum, University of Pennsylvania (UPM), 7 specimens, collected (1929) by F. Johnson.
- The National Museum of Denmark (NMD), 6+ specimens, collected (1928) by F. G. Speck.
- The Denver Art Museum (DAM), 15 specimens, collected (1937) by F. G. Speck.

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[1] A return to the River Desert Band in July 1937, made possible through a grant (No. 342) from the Faculty Research Fund, University of Pennsylvania, provided occasion for amplification of the manuscript in the field with the cooperation of informants as a final, and at the same time fortunate, step in its preparation. Opportunity was also afforded by this renewal of contact to examine 45 additional specimens of birchbark work of the band and to include discussion of their characteristics in the text. The investigation here presented is accordingly based upon study of 175 specimens of Algonquin birchbark containers.

[2] I desire to acknowledge the courtesy of Dr. Diamond Jenness, Director of Anthropology of the National Museum of Canada, in providing the opportunity to have the specimens of Algonquin decorated birchbark containers photographed and studied, in 1928, when they were lent to the University of Pennsylvania for the purpose.

b. River du Lièvre Band:
  The Museum of the American Indian, Heye Foundation, 5 specimens, collected (1928) by V. M. Petrullo.
c. Golden Lake Band:
  The Museum of the American Indian, Heye Foundation, 11 specimens, collected (1928) by F. Johnson.
d. Mattawa Band:
  The National Museum of Canada (NMC), 3 specimens, collected (1915) by F. G. Speck.
e. Timiskaming Band:
  The National Museum of Canada, 21 specimens, collected (1915) by F. G. Speck.

A more precise delineation of the territorial boundaries of these bands will be found in my recent report, covering the River Desert group (Speck, 1929) and in a study of 1915 dealing with the Timiskaming and River Dumoine Bands (Speck, 1915). During this period of field work the specimens and etymological notes forming the basis of the following report were obtained.

For the designs and bark work of the River du Lièvre band the illustrations and information given in an article by V. M. Petrullo (1929) have been used.

It is important to note before examining in detail the character of bark work and designs of the Algonquin that a close resemblance exists between the manufactures and decorations of this division and those of the Montagnais of Lake St. John (Speck, 1937), and that a marked differentiation is to be observed between the wares of these two when compared with those of the Têtes de Boule which intervene between the two, and those of the Barrière Indians, next neighbors on the north. In the case of the Têtes de Boule, we have the published results of the field work of D. S. Davidson (1928), whose collections from this tribe show almost no etched or scraped ornamentations on the sides of containers. A collection of bark objects from the Barrière Indians, made for the Museum of the American Indian by F. Johnson (1930, pp. 34–35), also shows the same lack of wall decorations on baskets. Aside from recognition of the efforts of those who by collecting actual material in the field have increased the portfolio of native art from which such studies as this are built, I am mindful of advantages derived from consultation in the preparation of the text with Dr. F. H. Douglas, Denver Art Museum; Dr. L. C. Eiseley, University of Kansas; and Dr. C. E. Schaeffer, University of Pennsylvania.

There has evidently been a factor at work in the St. Lawrence Valley and watershed affecting the art motives of the Algonquin and the Lake St. John Indians in a similar way; that is, toward profusion. And, in addition to this, the predominance of band-floral and leaf figures to the exclusion of human and animal forms has become characteristic of both peoples. This is brought out in the illustrations of specimens now to be shown.

The scope of the following report is not limited to aspects of Algonquin art of the past. The forces active now in the historical development of decoration here may represent a continuity of systems employed in at least protohistoric times in the region occupied, not necessarily derived from association with Europeans. The assertion of European origin of the nongeometrical art forms of the northeastern Woodland tribes has frequently been made without adequate proof by writers dealing with the area. Despite evident influence of modern conditions which will continue to affect the growth or the decline of native crafts, certain principles of decoration will be manifest in the work of different tribal groups which bear witness to individual art traditions possessed by them. What their age may be it will only be possible to surmise in most respects. The decoration of useful articles for the pure satisfaction of such performance to their makers is evidently an ancient cultural trait of the Woodland peoples. The continuation and even increase of these products for trade within or without the group, in other words, for gain, is also to be inferred as a native characteristic of every age of tribal life in the region. Even a lax form of professionalism may be marked for past as well as present phases of life, for there have been and are the more expert canoe makers, bowmakers, and the art creators whose manufactures are in demand, and who command admiration among members of their band. At the present time there may be observed in various families of the River Desert Algonquin objects preserved for their value and some of them in use which have come from the hands of some half dozen experienced bark workers; the creations of Mαckusi·′k·we (Mrs. Michele Buckshot) (pl. 42), Madenine Cesar (Mrs. Clement) (pl. 41) in particular, and some of the women of the MacDougal, Ottawa, and White Duck families. Thus there is traffic among the Indians themselves for the neatly made and decorated handicraft of their own experts. Commercialism has, to be sure, influenced the art industries of the band, as it has elsewhere among Indians of the historic period in general, increasing the demand and producing a spirit of competition, for which the object is gain. We may not, however, say that contact with Europeans has empirically created the art of the people. The impulse to decorate articles of use and to create fancy articles of minor utility, as well as to excel in their manufacture, should be credited distinctly to a native phase of culture. In their conversion from old to newer currents of progress through dealings with the encroaching civilized world, the Algonquin artists have grafted their tradition upon the latter and expanded it. The line to be drawn between antiques in native culture and those utensils customarily used which have on their part acquired acculturational features, is in reality a hazy and ethnologically insignificant one on the horizon of native culture history. The accompanying paper is, then, intended to form a contribution to our knowledge of living art phases of a people rather than a reconstruction of their art as a cultural possession of the past. The River Desert Band is numerically on the increase (469 in 1923, 552 in 1937). With a revival of interest in folk art which, while not conspicuously imminent now, might take place under the stimulus of educational guidance, forces could swing into action to promote the decorative arts to a still further development. It need cause little surprise to find that pulsations of interest in the calling of art as a possibility for revenue have induced designers here to introduce cut-out pattern figures into their repertoire which seem strange to Indian traditions, such as the representation of a ribbon bowknot, a goblet, and even (1937) a representation of the Queen's (literally, "chief-woman's") coronation crown. This product was a spontaneous creation of Madenine Clement celebrating the occasion of the royal coronation in London in that year, an event which created some stir even among the distant Indian subjects of the Canadian backwoods. In the eyes of the historian who is interested in acculturation it also attests the vitality of an art in the process of acquiring the character of memorial documentation.

TYPES OF BIRCHBARK CONTAINERS

The five major types of bark containers and receptacles made and used by the Algonquin include the following, as they appear in the plates:

1. Wi·gwe′mɑt‘, "birchbark receptacle" (pls. 30, *a*, *b*, *c;* 31, *a;* 33, *b-f;* 34, *a-e*). A container of varying capacity, from 6 to 24 inches in length, with walls generally less in height than the length, and tapering in toward the top (construction pattern, fig. 4, *a*). The outside of the rim is reinforced with a maple hoop, bound on with spruce or basswood wrapping. It frequently has a fitted lid attached by a skin thong to prevent its loss. This container serves the purpose of sewing box, trunk, and general receptacle, as its name implies, for women's effects and men's tools and work materials. Food is also occasionally kept in it. The majority of these baskets, as they are termed locally, show decorative motives on their sides and lids. In the bush life the wi·gwe′mɑt‘ is an indispensable article of equipment although it is being replaced by the tin canister and pasteboard carton among the Indians who dwell near the precincts of civilization. The grain of the bark is *perpendicular* to the rim.

2. Kik′^{w}bɑnā′gɑn, "vessel" (pls. 30, *d*, *e*, *f;* 31, *b-e*). Similar in construction to the preceding type (pattern fig. 4, *a*), except that the sides are higher, a bale or carrying handle of basswood is provided

and the cover is lacking. The seams are coated with pitch made of spruce gum to make the vessel watertight.[3] This is the carrying pail, of service in the transportation of maple sap in the sugar-making season, and of water to and from the spring. It is still used at all times except where it has become obsolete through the invasion of the commercial tin pail. Decorations on the sides are frequently seen. The grain of the bark is *perpendicular* to the rim.

3. P'ski·tanā'gan, "folded double" (pl. 32, *a*, *b*, *c*, *d*). A seamless bottomed, troughlike vessel constructed on the plan of pattern *c*, figure 4. The folded ends are sewn with spruce roots or the basswood inner bark (wi·gub'). This container, according to tradition over a wide region of the northern hunting area, is the original native

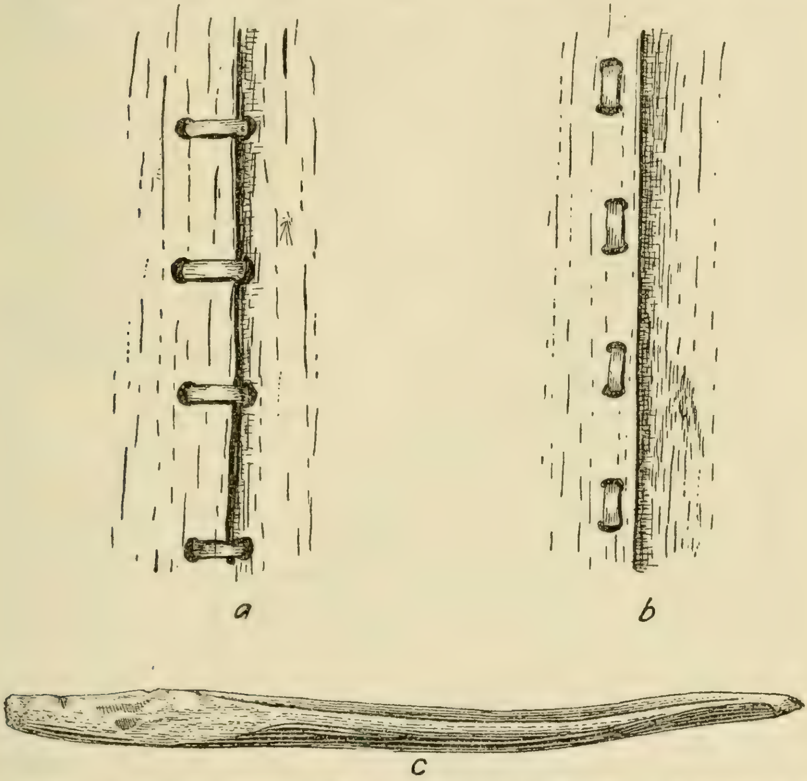

FIGURE 3.—Algonquin methods of sewing birch bark with stitches of spruce root in fastening the sides of containers. A basting tack.

a, *b*, Spruce root stitching; *c*, penis bone of black bear used in perforating bark for sewing with spruce roots (MAI, 16/4196). (For institutions indicated by initials see list on page 1. Catalog numbers are given when possible.)

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[3] Other types of containers ("bottles") were made and employed as watertight receptacles. A bear's stomach, turned inside out, was used for bear's oil, whisky, etc. Similarly a loon's gullet or deer's stomach was blown up and stretched, and turned for use as a container. These vessels were fastened with a twist of basswood fiber at the neck. The ear of a moose or deer was split and dried for use as a match container.

cooking vessel. Having no seams it is naturally watertight. When placed over hot coals it will resist the action of heat, if thoroughly wet beforehand, sufficiently long to allow water or soup to boil. This operation has been witnessed by myself and others. In recent times the folded bark vessels have retreated from their position of former importance to become sap troughs or receptacles for other liquids about the camp or farm. The grain of the bark is *parallel* to the rim.

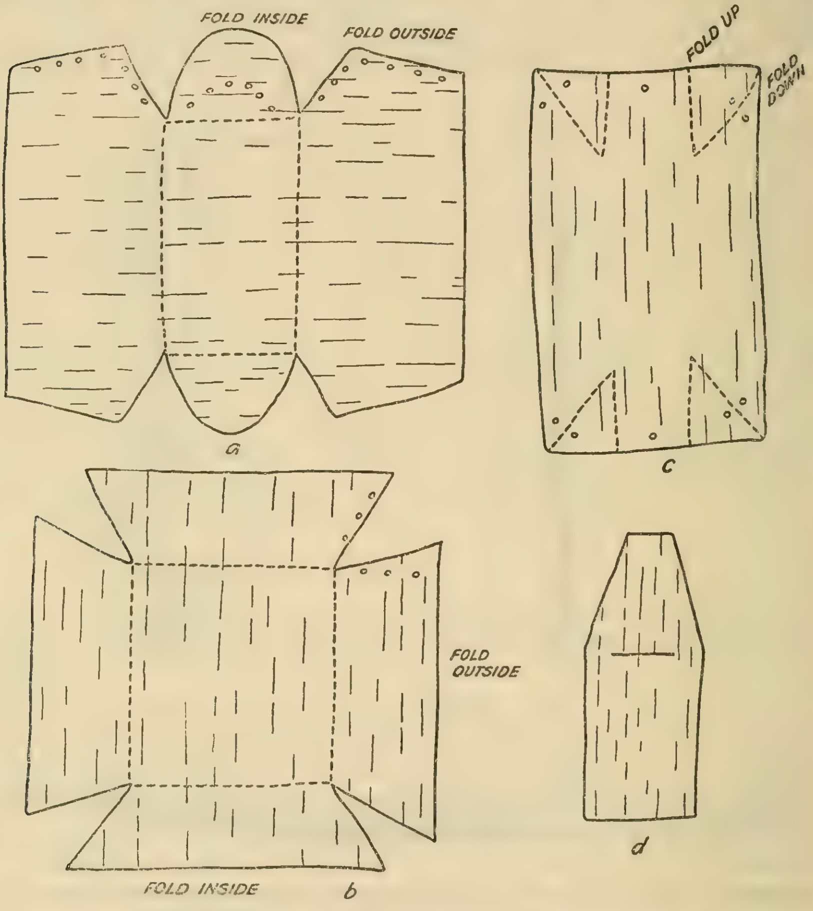

Figure 4.—Patterns for birchbark utensils (Algonquin).

a, Pattern for bark pail and container for berries and women's work materials (MAI, 16/4901); *b*, pattern for dish (MAI, 16/4900); *c*, pattern for seamless pail or boiler (MAI, 16/4902); *d*, pattern for rolled-up match box.

4. At'obā'gan, "pail" (pl. 32, *e*). A variation of the seamless vessel in which the ends are not folded over but merely bent together and caught with a fastening of the usual materials, spruce root or basswood fiber. It is used in the same manner as the preceding type,

usually for sap. Both of these containers (pl. 32, *c*, *d*) are of less permanent construction than the first two, and are not always provided with hoops to strengthen their rims. Nor are they so frequently decorated. The grain of the bark is *perpendicular* to the rim.

5. Wìgwasαnā′gαn, "birchbark dish," (pl. 32, *f*). Constructed from the pattern (fig. 4, *b*), this dish is of wide distribution in the birchbark culture area. It serves the purpose of an eating dish or bowl among the more remote hunters who are as yet not so generously provided with utensils obtained from the traders. The dish or food tray has a hoop and is occasionally decorated.

6. Figure 4, *d*, shows the pattern for making the cylindrical match box, by which the bark strip is rolled to form a tube and the narrow end tucked into a slit which holds and conceals it. These boxes are made of a size to fit the matches used and are not decorated. They are made similarly, according to our present knowledge, eastward through the territory of the Montagnais-Naskapi.

7. Pski·tonå̀′ge, "folded." This equally simple type of construction is to be listed separately although in native terminology the same designation is given it as type 3. A rectangular sheet of bark is folded double, the two lateral edges sewn with a whip stitching of spruce root (or basswood inner bark) to form a simple envelope (pl. 39, *a*). A section of the top of the bark (or flap) is left so that it might be turned down over the open end. To keep it from curling, strips of cedar wood are fastened inside the folder as stiffeners. A variation in construction is to place the cedar strips outside the folder and bind them so tightly that nothing can enter the orifice. These receptacles serve the purpose of preserving dried, or even fresh meat, from insects and also for the storing of clothing. Frequently such a "meat bag" (wi·yå̀s owαc) is made of *green* elm or cedar bark, in which to store foods like dried beaver tail (amikwαzo awαc, "beaver tail folded holder") and dried fish (nαmę̀teg) for a period as long as a year. The larger sizes serve as folded trunks in which to store fur clothing during the summer. When packed in one of these envelopes with quantities of cedar boughs, the furs are safe from insects. The folder is also used for the simple purpose of holding bait suspended temptingly in a bear trap, as a specimen from Mrs. Buckshot demonstrates (the scraped-away representation appearing on the front of this bait holder (pl. 39, *a*) is that of the pitcherplant, *Sarracena purpurea*, a symbol of the trap that nature grows in the plant realm to ensnare insects).

The similitude of these bark folders to the parfleches of the Plains area is a feature of comparative ethnology not to be overlooked. It lies in their constructional simplicity and in their adaptation to the same economic purposes; namely, the preservation of dried meat and the storage of clothing. Spier has pointed out the characteristic details of decoration which appear on the surfaces of the parfleches and their evident antiquity in Plains culture, and I have added some remarks along related lines in the study of birchbark techniques of the Montagnais (cf. Speck, 1937), showing that a similarity exists ostensibly between the primitive use of bark, or "tree skin" and animal skin, both serving in the raw state as materials of construction,[4] and also have drawn attention to the techniques of their ornamentation in the Woodlands and on the Plains.[5]

It has been noted in describing the constructional types of Algonquin containers that the principle followed here is to cut and sew the bark so that the grain of the bark forming the longer side (usually the decorated wall) runs *perpendicular* to the rim, The same principle is followed by artisans in birchbark among all the tribal bands from here eastward through the territory of the Montagnais and the Wabanaki divisions. And westward the observation holds true for Ojibwa and Saulteaux bark baskets, judging from available specimens. Western Cree and Athabaskan series, however, predominantly show the bark cut and patterned so that the grain runs *parallel* with the rim. I regard this as a feature of considerable significance in the distribution of types.

While the forms of bark containers in the various Algonquin bands are also strikingly like those of the Lake St. John Montagnais, it is to be noted that the Algonquin manufacture and use the ash-splint baskets woven in the simple under-and-over twill as frequently as they do the bark wares.[6] The distribution of splint basketry, however, ends with the boundaries of the Algonquin proper going northward. It is not to be found among the Têtes de Boule, the Barrière Indians, or the Montagnais-Naskapi.[7] Evidently the art of splint basketry has been creeping northward since the contacts of Algonquin bands with the Iroquois have begun. The reason for this assumption in regard to the origin of basketwork among more southern tribes may be found in pure ethnological theory, for the splint basket types of the Algonquin and the Iroquois are indistinguishable. The Algonquin, being thrown into association, even cohabitation, with the Iroquois subsequent to the establishment of the missions on the St. Lawrence two centuries ago, have undoubtedly developed the craft in common with the Iroquois.[8] I have made reference to this idea in two previous papers (Speck, 1920, p. 67; 1927, pp. 242–246).

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[4] The textual quality of wet, green birch or elm bark (*par écorceau*) closely resembles that of green rawhide (*parfleche*), a fact not without interest in the consideration of resemblances between Woodland bark containers and Plains rawhide receptacles, as discussed in the next paragraph.

The Canadian French term above has passed over into the vernacular of eastern Canada in the form of corceau (cáso), while in the English-speaking area the common term is *macock*, derived from Algonkian (cf. definition by A. F. Chamberlain, Handbook of the American Indians, 1911, pt. 1, p. 824).

[5] As the most recent contribution to literature on incised parfleche decoration I quote from Frederick H. Douglas (1938, p. 25):

"The origin of the type and its historical relation to the painted parfleche are not known. The design styles of the two types appear to be identical. The oldest information known to me about painted parfleches is that given by the picture of one figured in the report of Maximilian's 1833-34 expedition. The design and technic are like those of later times. As noted by Wissler, Sioux tradition states that the incising of parfleches came before painting.

"There are two theories as to the origin of the technic. One suggests that it may be an adaptation of the scraped method of decorating birchbark utensils, and the second ascribes it to the influence of Spanish methods of decorating leather horse furnishings.

"In support of the first it may be said that the Eastern Sioux certainly used birchbark; and that much birchbark was decorated by scraping. But the present center of incised parfleches is far from that of scraped bark. Dr. Verne Ray tells me that birchbark articles from near the incised parfleche area, as it is known from existing specimens, are not scraped or incised. The Crow crupper and sword case mentioned above are the evidence for the suggested Spanish origin of the practice. The Indian undoubtedly used Spanish horse furniture as a model for his own. Spanish leather was decorated by tooling, cutting and stamping, according to Arthur Woodward. The suggestion is that the Indian endeavored to imitate the effects created by these technics by means familiar to him, cutting and scraping. If he achieved effects pleasing to him on horse furniture, it seems as though the same methods might very well have been applied to other leatherwork."

In another paper Dr. Douglas lists 53 tribes which used parfleches. "Of these the scanty available evidence ascribes incised parfleches to but five, Yakima, Sanpoil, Warm Springs, Crow and Nez Percé." [Douglas, (1936).]

It will be observed from the illustrations of Algonquin bark wares that the forms correspond to those of the Montagnais throughout, except that the ovoid forms of the latter are absent among the Algonquin,[9] and the cylindrical are infrequent.

As for other particulars, we observe the wider base and narrower mouth, and the hoop of wood with spruce-root wrappings, which wrappings are never colored to produce the decorative effect that one finds on Têtes de Boule and Mistassini bark containers. Several divergences, in the form of basswood material sometimes employed for the wrappings, and the habit of more frequently applying pitch to the seams, mark off the work of the Algonquin from that of the Montagnais. The latter peculiarities appear more frequently as the border of the Ojibwa habitat is approached. The impression obtained from observing a series of Algonquin containers is that of constructional similarity with those of the Ojibwa, not only in the use of pitch for covering the seams but in the use of basswood bark for the binding material of the rims and occasionally for the seam stitching, and the use of hazelwood for the hoops. These peculiarities never appear in Montagnais bark containers. It will, however, be only when larger series of Ojibwa bark baskets shall have been collected, and especially those showing surface decorations which are as yet rare or absent altogether, that the diffusion of influence can be traced in this direction. The study made by Miss Densmore (1928, 1929) of birchbark forms and decoration in bitten patterns employed as suggestions for moccasin decoration affords some idea of general common properties in bark craftsmanship between the two peoples.

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[6] This simplest form of basket production ranges eastward to the Wabanaki as the sole technique there.

[7] The few specimens of ash-splint basketry collected at Lake St. John have in every case been traced to the hands of St. Francis Abenaki women who have migrated northward since about 1860 to join the Montagnais at Chicoutimi and Lake St. John.

[8] Specimens collected from the Iroquois at Lake of Two Mountains (Oka) in support of this statement are to be found in the collections of the Museum of the American Indian, Heye Foundation.

[9] The Montagnais form of this container is shown in Speck, 1937, pl. 1, *h;* pl. 18, *a*, *b*, *c*.

Further observation of constructive details of the bark work of the River Desert Band shows that the pattern outlines of the containers of type 1 result in the line of joining (the construction seams on the lower ends of the vessel) being nearer the bottom than in forms seen among bands inhabiting districts to the north and west. The constructed form is, therefore, similar to the work of the Montagnais on the east. The same holds true of the work of all of the Algonquin proper as far west as and including the Indians of Lake Timagami who are to be ethnologically classified with the Ojibwa. These remarks are based upon material collected by myself from the bands concerned, and reposing in the National Museum of Canada. Therefore an area may be designated for this peculiarity of construction which would include also the next characteristic of technique; namely, the "basting" or "tack" stitch in the sewing of the bark with the spruce-root split (wa′dapʿ). The tack stitch predominates, almost one might note, exclusively, in the method of bark attachment of this area. (The term "tack stitch" denotes that type in which the threaded root is made to penetrate the bark upward and down again within a short space, generally less than ¼ of an inch, then runs under the surface for a space of from 1 to 2 inches and comes out again, the whole attachment resembling the operation of "basting.") (See fig. 3, *b*.) Like the pattern outline just mentioned, this stitch predominates in Montagnais work and throughout the work of the Algonquin proper. To the north and west it gives way to a more complicated and artistic type of stitching, the "embroidery" stitch, in which the stitches are made to form a solid line touching each other, each advancing stitch being made to come up through the preceding one. The latter is characteristic of Têtes de Boule work and that of the Cree to the north and west, and especially of the bark sewing of the Athabaskan divisions. The tack stitch, it may be added, is a characteristic of the work of the Wabanaki groups as well. Its distribution also seems to include the Ojibwa about the Great Lakes, as observed in old specimens. The few specimens extant from the Beothuk also show the same. Whence it may be considered as an old seaming technique, possibly antedating the "embroidery" type.

The rim wrapping of Algonquin birchbark containers is of spruce root (wa′dapʿ) in most instances, though shreds of boiled inner bark of basswood (wi′gubʿ) and elm are occasionally substituted, since these materials are resorted to in the economy of the forests. When ash-splint baskets are being made, the presence of available strips of this material accounts for its use in fastening and rim binding. The rim wrapping is close and undecorated, the spruce roots being left in their natural color, except in a very few specimens where a dark shade appears as a result of being allowed to soak in tainted water. No cases of imbrication with quills or colored strands of material have been observed in the series of River Desert specimens examined, although they are invariably found in the bark work of the adjacent Têtes de Boule, and among the Cree to the northwest.

Another feature in the construction of bark containers of the Algonquin in general, as well as of the River Desert Band, is the fitted lid, with a hoop or "cuff" underneath, stitched with the binding material to the under side of the cover, and fitting inside the mouth of the vessel. This virtually necessitates that the rim have one hoop (maple) on the outer side only. One might venture a hazard that any critical ethnologist who at a glance compares this cover with the constructive features of European boxes would pronounce it an innovation derived from contact with white people. And it may, indeed, be true. The same type of cover appears in the containers of the Montagnais to the eastward, but it becomes rarer in passing to the west and is replaced by the flat lid without cuff among the Cree and the Athabaskan groups. Among the latter it is a cover tied loosely to the rim of the container by strips of leather.

It should also be mentioned here as an incident in the history of change in form of containers that an innovation has recently appeared in the types made by workers in this band (1938). Rectangular boxes sewed at the four corners, provided with fitted lids and decorated in the usual manner are being produced. I have not been able to trace the origin of this shape to my own satisfaction.

TYPES OF DESIGNS ON ALGONQUIN BIRCHBARK CONTAINERS

The Algonquin techniques of design, namely, the production of patterns on the dark surface of spring-peeled bark, by moistening and then scratching away the softened layer surrounding the pattern, as described for the Lake St. John Indians (Montagnais), follows identically the process of the latter tribe. The employment of bitten birchbark (miži′ni˙katowá^{n}, "picture-biting") and cut-out birchbark (mɑžine′žiga^{n}, "picture-cut") patterns is fully as characteristic here as in the aforementioned tribe.[10] Perhaps even more does the

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[10] The sequence of bitten pattern for decorative suggestion and symmetrical designs derived therefrom is fundamental to the Ojibwa of Minnesota as well. Miss Densmore's report is one of the few on this area to mention the bitten patterns, or transparencies, in the evolution of design. The Ojibwa she describes do not, however, work these patterns into bark-vessel decoration but use them for designing beaded bands. (Densmore, 1929, pp. 184–185, figs. 22–24.) The Algonquin do not invariably transfer the bitten patterns to their decorated bark objects but practice pattern biting for an amusement. The same is true of the Penobscot. (See Speck, 1940, 185–186.) And while both groups are alike in this respect, they regard the patterns so produced to be suggestive of the geometrical and floral figures that are produced in their art. For these two peoples, at least, there is a gap in the sequence of evolution from bitten patterns to bark decoration. There is some meaning in the Algonquin designation mažini′žegan migužéwinəbóžuwe, "cut-out decoration," applied to bark ornamentation, as respects the evolution of art. Davidson (1928, footnote 6, p. 2a) also has treatment of bitten patterns in art composition of the Têtes de Boule.

River Desert Algonquin woman rely upon her cut-outs for the transfer of pattern to her basket than does the artist at work farther north. And, again, the appearance of geometrical decorations in the bark etching is less frequently met with here than to the northward. An examination of designs, furthermore, shows the Algonquin, especially the bands nearer to the Ojibwa of Ontario, to be somewhat more given to the use of animal and human outlines for ornamentation than the Montagnais.

But the feature of striking importance in a comparison of the bark-basket art motivation of this and the adjacent areas occurs in the decoration of the space just below the hoop and rim, with an encircling band of varied outlines. It is found in so many of the Algonquin bark objects as to challenge attention to its origin and its meaning in the puzzle of design distribution.[11] This particular feature is shown in the sketches in figures 5–8 and plates 30, 31. At first glance, indeed, it would seem probable that its origin might lie in some detail of construction, for technical precursors of decoration have always a high probability as explanatory suggestions. In this case there is reason to close the assumption with an affirmative solution. Specimens in

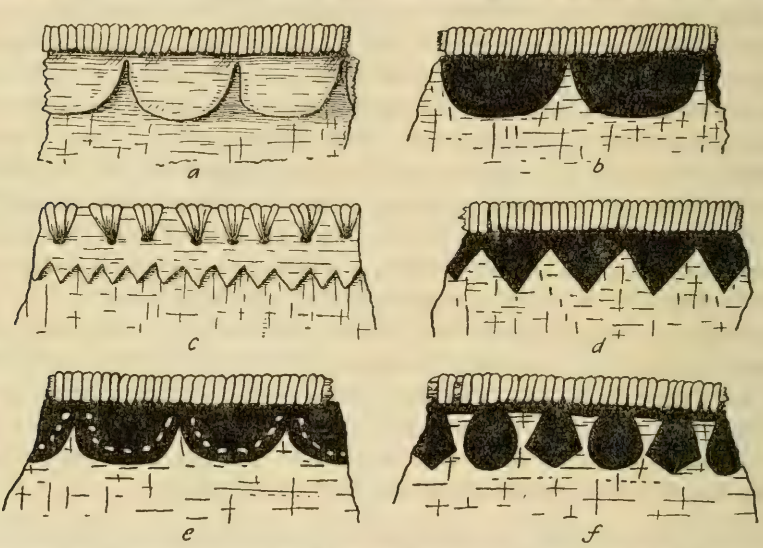

Figure 5.—Rim reinforcements of Algonquin birchbark containers and decorative borders derived from them.

a, Rim with birchbark reinforcement below hoop for strengthening and for decorative effect, River Desert Band (NMC); *b*, representation of reinforcement in scraped-away design for decoration, River Desert Band (NMC); *c*, rim reinforcement, River Desert Band; *d*, representation of same, River Desert Band; *e*, *f*, elaborated representations of reinforcement principle, Timiskaming Band and River Desert Band, respectively (NMC).

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[11] Boas (1927, p. 55) emphasizes the importance of rim binding in North America and Siberia, both as a technical feature and as a field of decoration: "In a bark basket the rim must be strengthened by a band, to prevent splitting, and the band and the sewing set off the rim from the body."

the National Museum of Canada from the River Desert Band, and from the Golden Lake Band in the Museum of the American Indian, and others recently (1937) added to the series—half a dozen in all—are found to have a reinforcement of birchbark sewed into the rim and extending a short way below it. This takes the form of a cut-out decoration as well as a reinforcement, serving the double objective of decoration and of strengthening. Among the Indians this feature of construction is called the "canoe wrapping," since it is so often resorted to in sewing the gunwales of canoes where the bark of the sides join them, as a measure of strengthening the attachment. It also functions similarly in leather work as shown in the edging of moccasins.

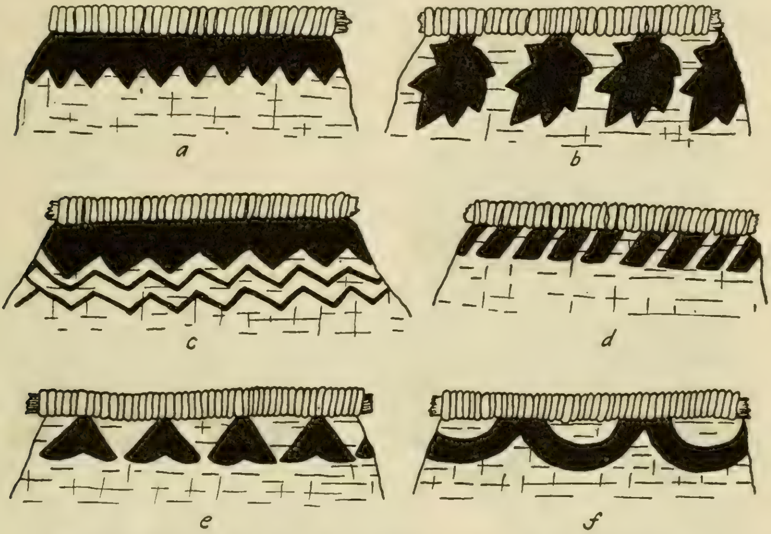

FIGURE 6.—Decorations below rims of birchbark containers.

a, *b*, River Desert Band (NMC, III, L, 19, 20); *c*, *d*, Timagami Band (NMC, III, G, 248, 256); *e*, from birchbark dish (NMD); *f*, dish, River Desert Band (MAI, 16/1597) and dish 4½-inches in diameter (NMD).

Just why this peculiarity of bark-basket construction should occur with such frequency among the Algonquin and not among the Montagnais is, however, not so simple to explain. Whether or not it has a distribution to the west or northwest in the direction of the Cree and Saulteaux remains to be found out. At present it would seem that it has, judging from the few specimens of Cree birchbark basketry that are available from the Saskatchewan area. We may hardly speculate further in this direction at the present time.

The occurrence of the bark rim reinforcement in baskets of birchbark of the Athabaskan and Sahaptian Tribes is stressed by Boas (*in* Teit, 1909, pp. 477–478), raising a question as to the history of this particular feature of construction that calls for more information on bark wares of the intervening territories.

In the decoration of the surface of the birchbark, it should be noted for the Algonquin that both the negative, and, to a slight extent, the positive, methods of bringing out designs are employed. In the former the cut-out stencil is placed upon the dark surface of the material and the area around the pattern is scraped away until the lighter undersurface is exposed. It bears the designation *sgraffito*, "scraped." The design is accordingly not scratched into the dark coating of the bark, as it is in the positive process, but is left in the negative state after the background has been taken away.[12] All the bark decoration of this and the immediately neighboring groups follows this scheme, while the distant Wabanaki tribes,[13] and the Ojibwa[14] in some places, employ exclusively the positive (inscribed) process. The combining of the two, however, takes a certain form among the Algonquin, as well as, to a slight extent, among the Montagnais. In these cases the interior of the space within the design is scraped out by the positive method, producing a smaller figure which follows in outline the general contour of the larger one. The effect is to show something suggesting partial open work. It is, however,

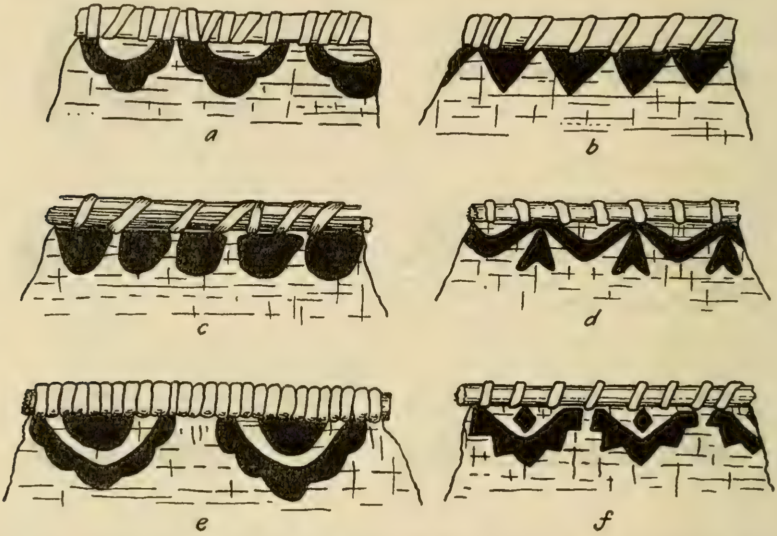

FIGURE 7.—Decorations below rims of birchbark containers (River Desert Band).

a, *b*, *c*, From birchbark dishes, 10, 8, and 4 inches in diameter, respectively (MAI and NMD, 2 specimens); *d*, dish, 8 inches (NMD); *e*, pail (MAI); *f*, dish, 8 inches (NMD).

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[12] That *sgraffito* decoration in the Old World had so short a life-span as a development in ornamental technique (*sgraffito* was done on a coating of plaster at Bologna up until the seventeenth century), has been something of a puzzle to students of the history of art. A similar process occurs in calabash decoration in the West Indies and in enamel decoration in Mexico.

[13] For illustrations of Penobscot decorations of this type, see Speck (1927 and 1940).

[14] Specimens procured from the Indians of Long Lac, Ontario, show the positive process in producing geometrical designs.

not a common type of ornamentation, but one evidently favored by certain more skilled operators (fig. 24, *a;* pl. 33, *c*). One of the three specimens from the Mattawa Band and some of those from the River du Lièvre Band show this development well worked out (pl. 33, *c*, and Petrullo, 1929, figs. 66 to 69).

The containers (pl. 34) made by women of the Timiskaming Band show some deviation in ornamental conception from those of the eastern bands of the Algonquin, in the greater frequency of their animal figures. We might attribute this to the influence of the Ojibwa in the older phases of whose art animal forms are outstanding.[15]

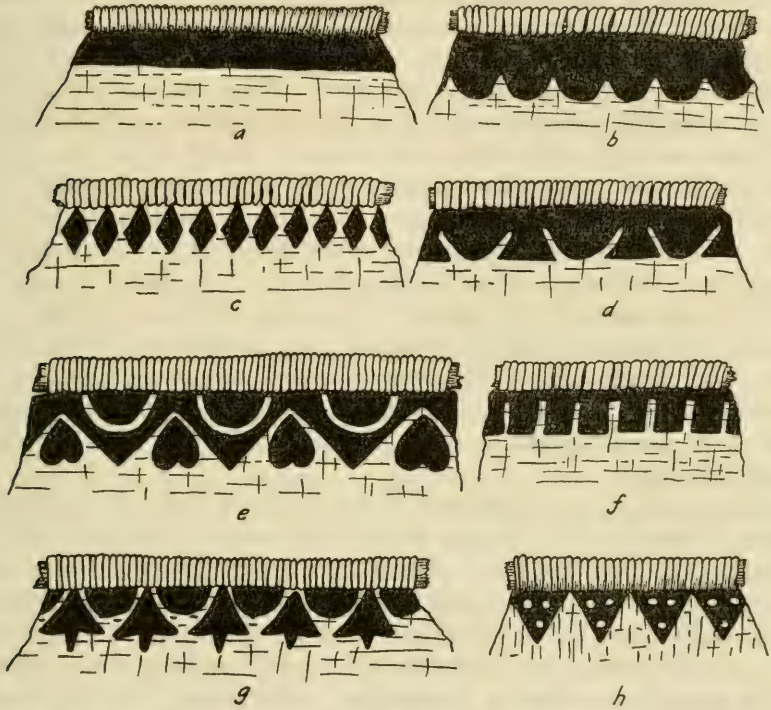

FIGURE 8.—Decorations below rims of Algonquin birchbark containers.

a, Timiskaming Band (NMC, III, L, 108); *b*, *c*, *d*, Mattawa Band (NMC, III, L, 189–91); *e*, River Desert Band (Rochester Municipal Mus.); *f*, Timagami Band (NMC); *g*, *h*, River Desert Band (MAI, 16/1595).

Discussion of the decorative devices of this band would not be complete without mention of the process of sewing the birchbark cutout figures themselves directly to the surface of the container with an edge stitching of spruce roots. This ornamental technique, called mi′ndjiməgwā′de, is shown in figures *a*, *d*, plate 37. In these instances the cut-out figures are applied directly to the surface to form a positive motive of embellishment. No medium of transfer is brought into play, as in the case of the incised or scraped-away designing. It possesses an elemental character as one might estimate the growth of the decorative impulse from an historical point of view.[16] Yet no conclusions should be drawn from the nature of its simplicity or from its distribution until wider surveys and a fuller background of knowledge of changes in styles of ornamentation have come into our hands. As inquiry reveals, the functional purpose served by this particular device of ornamentation is, however, perfectly clear in the case of the artists of the River Desert Band. The sewed-on cut-out figures appear on the sides of containers only when these are made of "summer" bark. This seasonal phase of the material lacks the dark coating on its inner surface which alone makes the "scraped-away", *sgraffito*, process possible to be performed. There is, accordingly, no other manner in which decorated outlines could be applied than to cut them out and stitch them on, unless it would be by the use of colors, and this process, for some unexplained reason, has not been adopted in the area. Stitching-on is, then, a substitution for the more usual form of ornamentation when required by the nature of materials. And when, through paucity of winter bark, vessels are made of both summer and winter bark on opposite sides of the same article, then both processes of decoration are thought of. Four specimens, the handicraft of Madenine Cesar, have been obtained as evidence of the technique (pl. 37), and Mrs. Buckshot was familiar with it in her tradition of local methods preserved from the time of her childhood.

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[15] Among the River Desert people esthetic appreciation seems to have turned in favor of floral designs, as typified by Mrs. Buckshot (see page 257).

Here, in short, is a technique of decoration which still retains its pattern source in full evidence as an initial step in designing without transfer to another medium. Sewed-on patterns are reserved for the garnishment of containers made of bark taken off in the summer time, as has been noted. The specimens show admirably the utilization of the sewed-on process as a substitute for scraping designs on surfaces which would otherwise be impossible to decorate. The objects in question are made of part summer bark and part winter bark, which would result in a one-side-only ornamentation distasteful to the maker. This explanation was given by both women who employed the device. One might wonder in turn why the idea of painting or stamping designs had not presented itself as an alternative in such cases. But it should be noted that Mrs. Buckshot (74 years of age), one of the oldest artisans of the band, could not testify to having ever seen bark containers so embellished, i. e., with figures in color. And this despite the recollection that stamped designs were applied to leather articles of clothing.[17] The sewed-on development seems to be practiced by only a few women of the band (Madenine Cesar, in particular) so far as contemporary material from the Quebec Algonquin shows. Its appearance in the series of bark designing processes is significant in the history of northern Indian art, and somewhat exceptional forthwith.

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[16] As actually happened, in one instance a cut-out pattern of a "coiled snake" used for *sgraffito* on a container was later found sewed as an ornament upon a birchbark cup made of summer bark, and collected by J. Patman.

An extreme development of the cut-out, sewed-on technique is remarkable in the work of groups in Saskatchewan (Athabaskan and Cree), but how this relates to the similar, though weaker, development of the art so much farther east is to remain an unsettled question until intervening phases of artcraft have become known. Among the western groups referred to, the birchbark used in construction of containers is the "uncoated" (summer) bark, from which it is evident that a connection exists between the use of sewed-on patterns and the uncoated bark.[18]

There is still another feebly manifested inclination on the part of River Desert birchbark decorators to employ the idea of stitch-designing, or, as it might be termed, spruce-root embroidery. In this form of decoration the spruce root is treated as one would a thread to form a coarse embroidered outline. The figures so produced among Algonquin craftsmen are usually simple and geometrical and are not filled in. Neither are plant or animal outlines in evidence. This technique is here only a weak and incidental feature in the series of ornamental tricks. It would seem to be an adaptation of a functional process of sewed-fastenings to decorative purposes. Again we meet with this feature of root-designing among the Cree of Saskatchewan, in the same area where the sewed-on cut-outs are prevalent. A carry-over from the splint-basketry-rim fancy work of Algonquin (kidji·′gəni·gɑ‘, "fancy-work") and Iroquois baskets appears in one example collected at River Desert (pl. 39). In the case mentioned it happens that the artist (Madenine Cesar) of her own accord combined the sewed-on, cut-out ornamentation with the spruce-root rim loop fancy work—both of them rather exceptional in the local forms of decoration.

A survey and interpretation of the historical meaning of the spruce-root stitching and the cut-out, sewed-on designs leads to consideration of the possibility that these techniques may be antecedent to the porcupine-quill mosaic process which appears sporadically among Algonkian peoples in the Great Lakes region and the East. Spruce-root designing is associated with a skeuomorphic source of ornamentation. Porcupine-quill designing stands out as being conceptual and more definitely esthetic. The solidly filled decorated areas of birchbark decoration in porcupine-quill mosaic bear resemblance to the solid areas of the bark cut-out decorations, and where the spruce-root stitching is arranged to form open decorative patterns a similarity appears to the open-work porcupine-quill small leaflike figures produced in some central Algonkian bands. This is especially true of work of tribes in the Cree-Athabaskan area where the roots are dyed in colors. Such connections, however, have little bearing upon the types of decorations in favor among the Algonquin proper, for it may be noted now that attempts on the part of the latter to utilize porcupine quills are few and irregular. The Algonquin have not adopted this form of bark decoration, either through the influence of their Ojibwa neighbors 200 miles to the westward or through their own art initiative.

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[17] A specimen of deerskin leggins, worn by her defunct husband in winter, was so ornamented by Mrs. Buckshot.

[18] In the collections of the Denver Art Museum are some Wisconsin Ojibwa containers with designs in surface painting, while examples of "sewed-on" figures in birchbark from the Ojibwa of Minnesota, identical with those figured in this paper, are reported in the same collection by Dr. F. H. Douglas.

The resort to the use of bitten patterns for the production of suggestions of design outlines to be transferred to the sides of bark containers, a practice so characteristic among the Montagnais, is one, however, not entirely overlooked by artists among the Algonquin. Not all, however, are capable, through having been provided by nature with opposed pointed teeth to make design biting feasible, of operating their creative desires in this fashion. Madenine Cesar (Mrs. Pierre Clement), for instance, who is rated the most gifted among the River Desert Algonquin in this line, finds a particular and a rich inspiration in designs bitten in outline into thin folded layers of the inner membrane of birchbark. M*a*ckusi·′k·we, "Fair Meadow Woman" (Mrs. Buckshot), on the other hand, produces her designs for bark work by the cutting-out method. Both, however, achieve plant and floral patterns by their preferred systems. Madenine Cesar furthermore utilizes the bitten patterns usually for silk, yarn, or beadwork, by basting the bitten figures after they have been trimmed out upon the surface to be decorated and stitching the beads or colored thread atop the pattern. (Among bands more closely in contact with trade sources, patterns of paper are similarly used, the pattern beneath the finished design being picked out with a needle afterward to remove it.) Madenine Cesar, nevertheless, constantly uses cut-out figures for her bark decorations. I would regard the cut-out process for the present time (1930–38) to be more characteristic of designing in birchbark ornamentation among the River Desert Algonquin.[19]

The method of producing patterns by means of biting may be described in more detail. They are usually executed upon a thin sheet or membrane of inner birchbark folded once or twice. The biting is done forcibly between opposing pointed teeth, usually the canines. The sheet is turned to this side and that, moved forward and back to track a series of impressions forcibly indented without perforating the material. The results are ovals, curves and radiating lines. Then the sheet is removed from the mouth and opened up, displaying symmetrical figures suggesting highly varied life forms to the beholder. Blind imagination alone directs the movements to produce outlines—imagination enriched by experience and maxillary control. For the most part they are given floral interpretations. The figures assume a still more marvelous character when held up to the light as transparencies. Next comes their utilization in the decorative system. Here among the River Desert people they are cut out with scissors and laid as patterns upon surfaces to be ornamented with beads or silk embroidery. Only rarely, we are told, are they employed as patterns for birchbark decoration when found suitable in the eyes of their creators.

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[19] Since the above was written I had occasion again to observe Mrs. Buckshot, in the summer of 1938, making some thin birchbark patterns by folding the sheet double and cutting the ouline desired on one side only with scissors, producing a half-image in profile. This formed a single flower when opened up. This led me to inquire further, and it developed that she sometimes resorted to the method in trying out for new floral ideas. Folded symmetrical patterns are not, however, made to produce a string of connected cut-out figures, as they are in the attenuated paper cut-out patterns snipped out by white children.

The design register of the Algonquin is not a very definite one as far as interpretation goes, nor is it particularly circumscribed in range. The functionally explainable border patterns on the surface below the rims of bark containers, discussed on a previous page (244), are apparently the most fixed characteristic that we can observe and a constant one among all the bands of Algonquin classification.

The portrayal of human and animal forms covers the usual range of male and female, moose, deer, bear, dog, mink, otter, partridge, loon, duck, and beaver (figs. 9, 10, 11). Animal motifs are more numerous among the Timiskaming band, whose affinity in culture with the Ojibwa is marked (fig. 11).

The band floral figures so suggestive of Montagnais work are common in combination with simple loose elements (figs. 13, *b*, *c*, *d;* 14, *b*).

The smaller single elements of decoration (figs. 17, 19, 22) are strikingly present, however, in Algonquin ornamentation. In composition over a broad surface they seem to form a favorite style of embellishment, as will be noticed by examining the sides of decorated bark pails and baskets (pls. 30, *d*, *e*, *f*, *g;* 31). Among these elements the outlines of leaf (ani·′bi·c), berry (mi·na′n‘) bud, flowers (wāpi′gwun), and stems predominate. And it should be noted that the Indian's fondness for playing cards has prompted the adoption of the diamond (kayes·a′wes·$^{\alpha}$k) (figs. 19, 22), heart (wəde′′), club, and spade (both called leaves), so popular and appealing to the eye of mankind everywhere. In several instances the ribbon bow appears as a design pattern.[20] The Algonquin artist is perfectly conscious of the origin of these particular patterns in her repertoire. Among all of those questioned, however, a native source of conception is claimed for the other simple pattern elements. Among these is

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[20] Represented by a specimen in the Denver Art Museum.

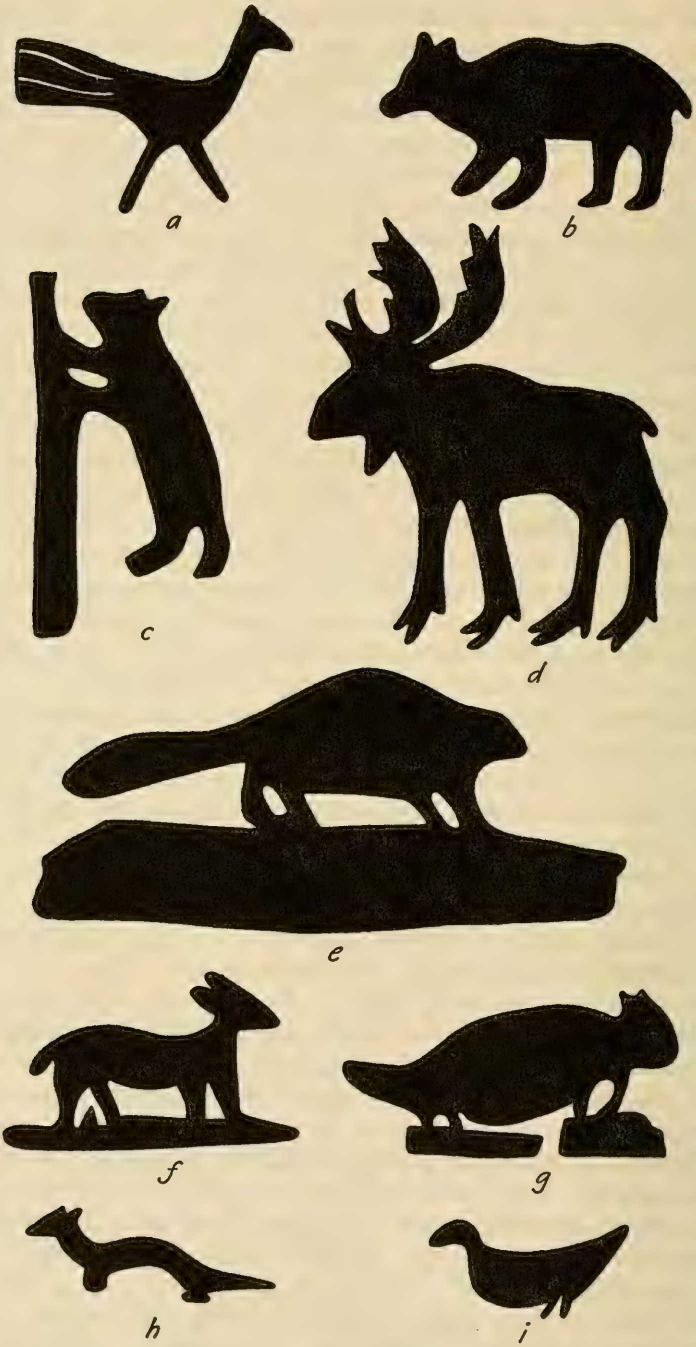

Figure 9.—Cut-out patterns for decorating birchbark containers (*a–e*), and animal figures from decorated objects (*f–i*) (River Desert Band).

a, Partridge; *b*, bear; *c*, bear making his mark on tree; *d*, moose; *e*, beaver; *f*, deer; *g*, beaver; *h*, otter; *i*, duck.

emphatically the "arch" (ci·ba′usa) (figs. 14, *c;* 21, *b;* 23, *b*), which may have formerly been a representation of the rainbow (adegwa′ ni·bi·sa, "holds back water"). The figure is consistently prominent with sky concepts of the area, although the informants do not so apply it now. The ellipse, the stem with three leaves, trefoil (both called ani·′bi·c, "leaf"), the dome, the "toad's legging" or pitcherplant (pls. 1, *d, e, f, g;* (omakaki·′mi·ta′s) or twist,[21] the scallop, and the dome with

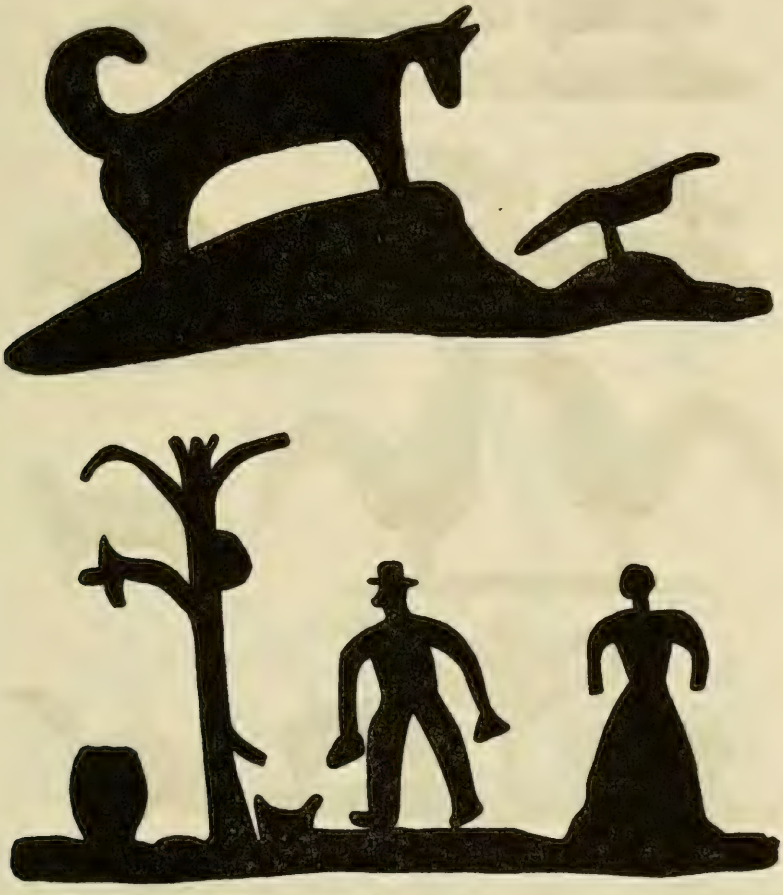

FIGURE 10.—Realistic decorations on birchbark maple-sap, or water pail (River Desert Band).

A dog chasing a partridge, and man and wife engaged in tapping sugar maple and collecting sap. The sugar barrel is shown at left. The spill inserted in the tree and sap pail at right. The bulge on the tree trunk is a burl out of which wooden food bowls are made.

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[21] This figure represents the leaf of the pitcherplant (*Sarracena purpurea*), which has similar significance in Ojibwa etymology (cf. Densmore, 1929, p. 14; 1928, p. 379). In Penobscot symbolism this is the "fiddle-head," or fern crozier, underlying the double-curve series. Here it is also a powerful antidote.

serrations on its straight edge (fig. 19, *d*),[22] are among those of an old native derivation, according to the testimony of their users.

For several others, namely, the mapleleaf (ana′tukw ani·′bi·c) and the five-pointed star (fig. 16, *a*) and the cross (tci·ba′iatək, "ghost-

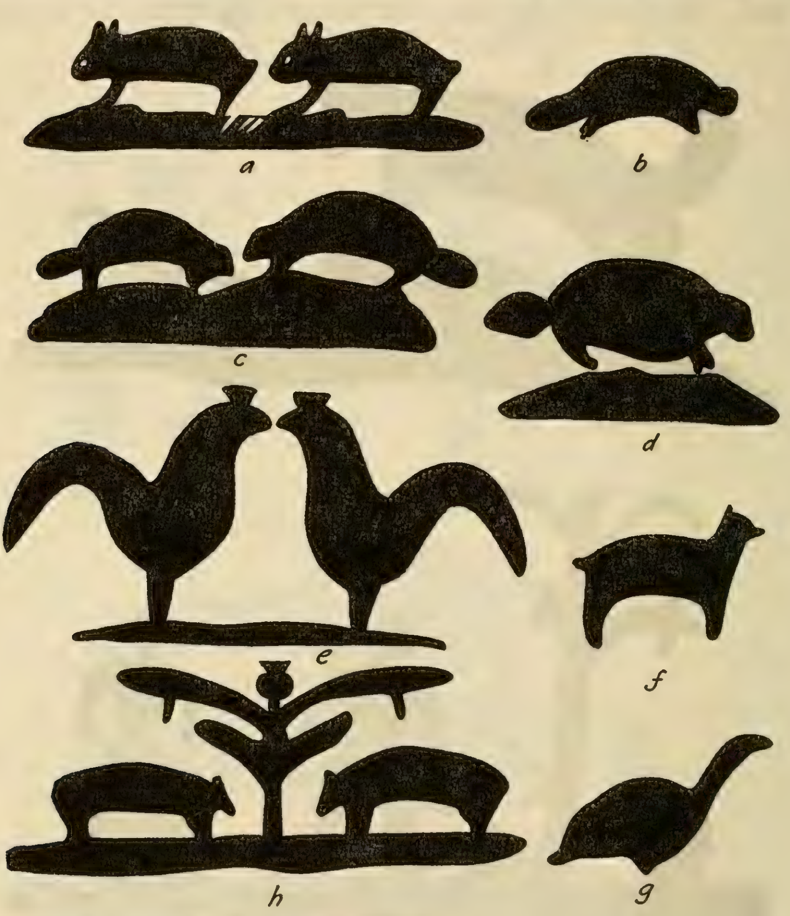

FIGURE 11.—Designs from birchbark containers (Timiskaming Band).

a, Hares (NMC, III, L, 108); *b*, beaver (NMC, III, L, 102); *c*, beavers opposed; *d*, beaver (NMC, III, L, 101); *e*, cocks opposed symmetrically (NMC, III, L, 103); *f*, *g*, doe and duck (on opposite sides of basket) (NMC, III, L, 102); *h*, bears opposed symmetrically under "double-curve" tree (NMC, L, 100).

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[22] An identical figure occurs in Delaware art under the name of "flame." To the Delaware this figure is an ancient one by tradition, as stated by Tom Half Moon's wife, who employed it in her bead-and-ribbon work. Since the figure, which attracted some attention through these occurrences, is a possible legacy in the art register of the woodlands from an early period, I took occasion to make a casual search for its appearance in the designs of living groups and in archeological material. Results so far have been to show its occurrence in Winnebago beadwork and Delaware-Munsee ribbon work, in Osage beadwork on a cloth coat, and finally (most significantly) as an incised ornamentation upon the body of a vessel excavated by Clarence B. Moore in a mound on Black Warrior River, Ala., and figured in the Journal of the Academy of Natural Sciences of Philadelphia, 2d Ser., vol. 13, pt. 2, 1905, fig. 74, p. 183. In all of these instances its form is identical with the figure illustrated herewith (fig. 19, *d*). Whence the native estimate of its age and character may be considered as worthy of further attention by investigators of art history in the East.

wood''),[23] a similar nativity is asserted, but I would quite agree with the sceptic who, upon critical consideration, places these, with the card emblems, in the category of patterns borrowed recently, that is, within 50 years, from decorations in common use among the Canadians.

The element designs, nevertheless, lie strictly within the constructional realm of the bark cut-out stencil patterns and we cannot deny without sufficient proof that they are as indigenous to the old art life of the region as the cut-out process itself is. After setting to one side those designs whose European origin need not be questioned, we observe the remainder to form elements in the ornamentations of peoples in the north as far as the Cree, the Naskapi, and others.

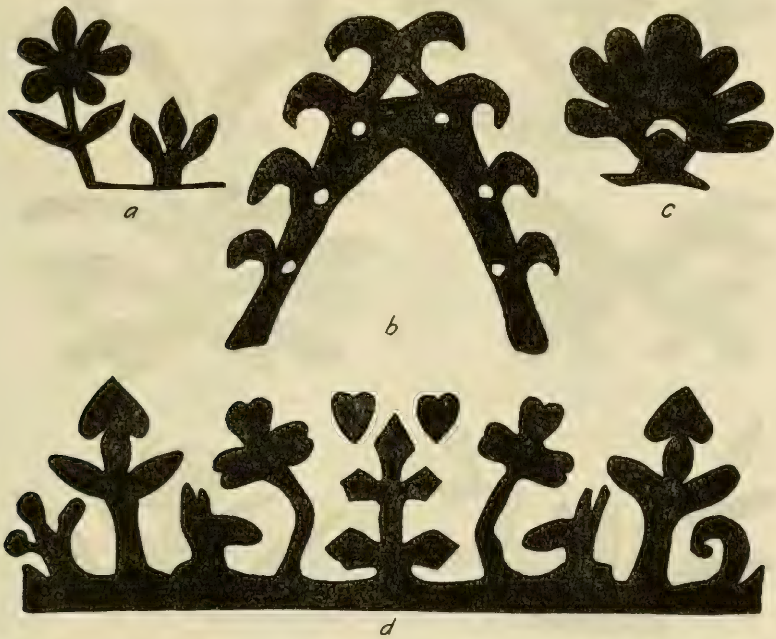

Figure 12.—Designs on birchbark containers (River Desert and Mattawa Bands).

a, *b*, *c*, Designs from sides and ends of bark container (Mattawa Band) (NMC, III, L, 191); *d*, scene from side of basket, representing hares' heads in setting of forest profile, as interpreted by Mrs. Buckshot (River Desert Band) (NMC, III, L, 89).

Thus, it would seem, there existed an old category of design elements, common to a wide area in the northeast, which has descended more or less intact among the dispersed populations, suffering in the course of time some losses from the original body of motives as well as some accretions from the outside. And finally, whether the cut-out figures have ever possessed a different symbolism than they now have (see

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[23] The figure 14, *a*, is an unusually suggestive conception of the River Desert artist. She has combined the "cross" figure with that of the heart of Christ shown in the middle of the group, and, being unable to resist the habit of tradition, has introduced a floral modification above the heart and turned the arms of the cross into leaf figures.

p. 270), they have come to acquire a floral connotation, under the native name, pa′gwədjiˑ wapi′gwun, "wild (or orphan) flowers." The cut-out patterns appearing in such profusion upon Algonquin bark receptacles are for the most part unspecified varieties of these growths.

In the design register of this band the representation of the yellow water lily (*Nymphaea advena*) is repeated with great frequency and in a variety of modifications which do not always betray its identity to European eyes. Rarely are the botanic features so realistically preserved as in figures 22, *g*, *h*; 25; plate 35, *b*, *d*. In seeking the reason for its favor among artisans, an observation by Madenine Cesar answered the question. She said of the pond lily, "That is what the muskrat eats (wažɑckwē′de)." In native esteem this is a sufficiently cogent reason for the frequency of the yellow lily figure in decoration of storage containers intended for food and for other possessions. Do we need to be reminded of the hoarding habits of the rodentia to understand the curious force of symbolism habitual to the Algonkian

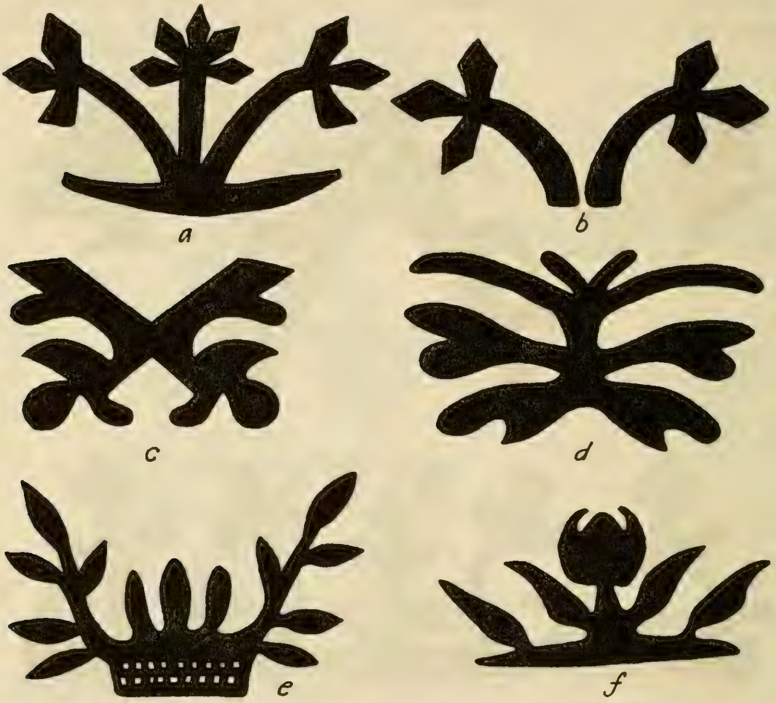

Figure 13.—Symmetrical band floral designs from birchbark containers (River Desert Band).

a, ***b***, **Flowers, on sides of baskets (NMC, III, L, 19, 20);** ***c***, ***d***, **from opposite sides of same container (III, L, 89);** ***e***, ***f***, **flowers from baskets.**

mind? And the *Nymphaea* is furthermore edible, not only to beaver and muskrat, but to the Indian himself who hunts the creatures for food and fur. Beneath the symbolism here is linked an association ever-present in the connectivity of nature. I mention the instance of the yellow pond-lily symbol in particular, since it affords an opportunity to connect again the art motivation of the Algonquin with an indigenous and locally characteristic object in the tribal environment. It is not, indeed, the French lily, introduced sporadically into the New World flora, which provides in this case the inspiration of art, nor is it the scented pond lily (*Castalia odorata*), in such favor among white people. The latter I have not as yet observed in the endroits of the reservation.

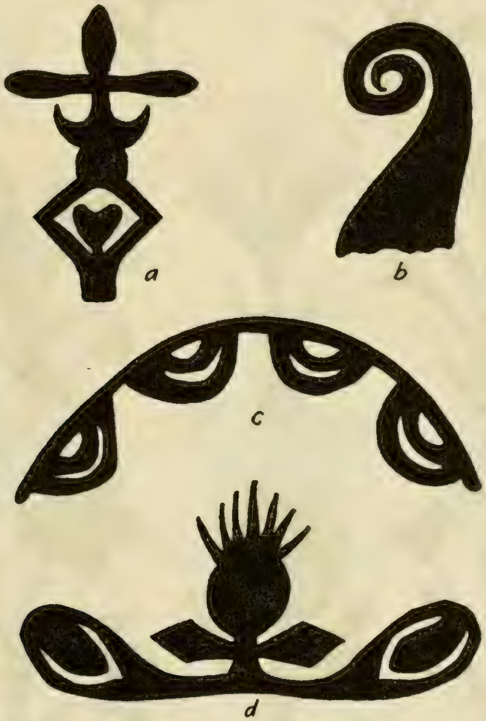

FIGURE 14.—Designs from sides of birchbark basket (River Desert Band) (NMC, III, L, 89).

a, Elaboration of cross and heart; *b*, flower (fern head?); *c*, arch, rainbow; *d*, flower.

Among those who, as I recall it, have indicated preference for one or another type of design, Mαckusi·′k·we (Mrs. Buckshot) expressed her preference for floral over animal figures in her work. I believe I had a similar impression of the taste of artisans in talking with other women.

A formalism in plant representation is strikingly exhibited in the series of slightly varied contours which show little regard for specific botanical features of the plants chosen for reproduction. The rule which holds in the majority of cases seems to be to cut-out patterns representing floral growths leaving a thick vertical center stalk surmounted by a bulbous head (equaling the blossom or fruit), with symmetrically placed ovals in pairs placed below to represent leaves

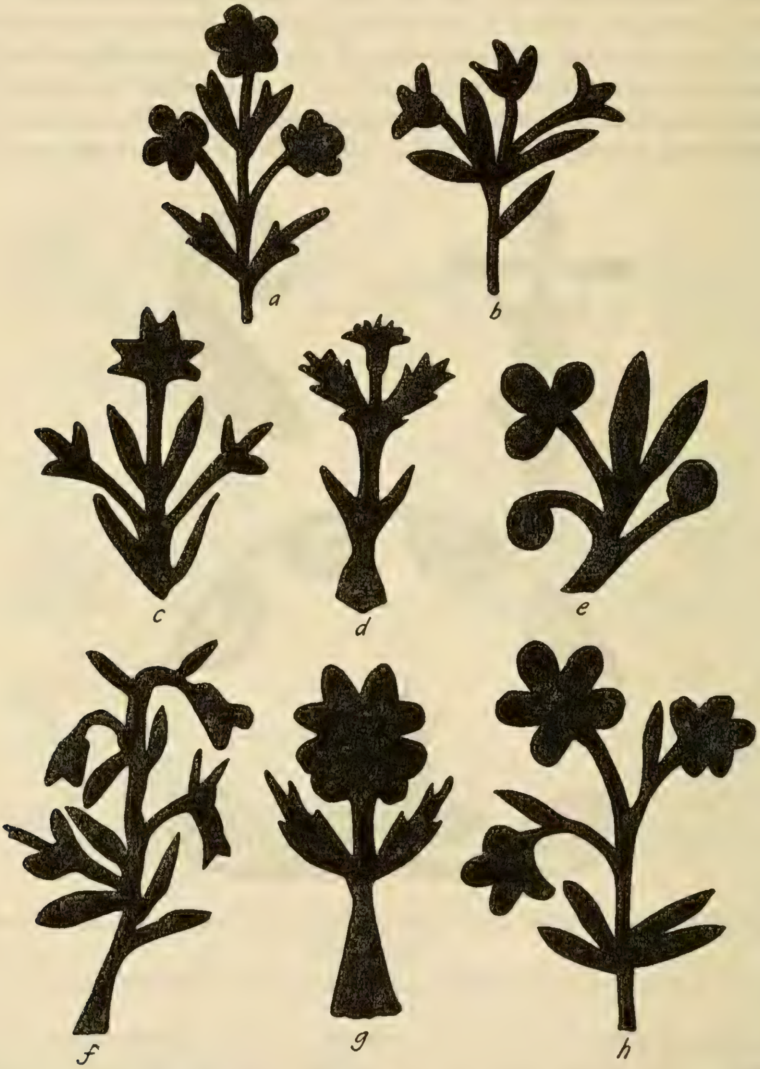

Figure 15.—Birchbark cut-out patterns applied to surfaces of containers and baskets to outline decorative scraped-away designs. They represent flowers and plants, some general, some specific (River Desert Band) (MAI).

branching from the stalk. The base line is often broadened, sometimes a little domed, to represent the earth. (See the varied series in figs. 13, 15, 25.) Notwithstanding the prevailing disregard for botanic accuracy just mentioned, the makers of the patterns, both cut-out and bitten, confess to seeing in them the likenesses of plant forms which they can name. The muster of named identities given in response to questioning includes berries of every kind, hawberry, leaves of every sort, maple, "trees," white pine, spruce, balsam, elm and ash, and the favorite outlines of swamp vegetation, the pond lily and pitcherplant occurring with the greatest frequency. One need not hesitate long in deciding what elements of environment engross the imagination of the simple people whose art we have here spread out before us.

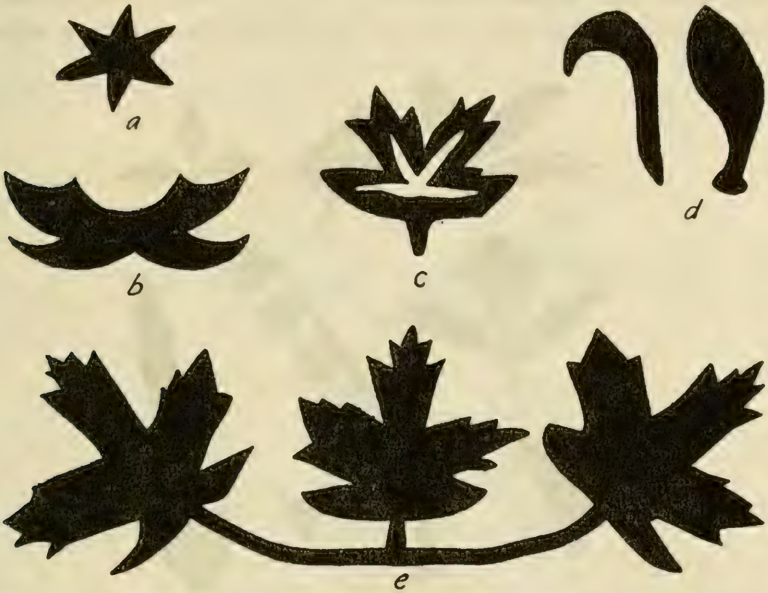

FIGURE 16.—Designs from birchbark vessels and baskets (Timiskaming and River Desert Bands).

a, Star, five in series on one side of basket (Timiskaming Band) (NMC, III, L, 102); *b*, band-curve design on cover of c (pl. 34 c) (III, L, 104); *c*, maple leaf, four in series on one side (III, L, 102); *d*, sprout of a plant and leaf (River Desert Band); *e*, maple-leaf cluster (Timiskaming Band) (III, L, 103).

The placing of the design figures on containers is manifestly a matter of individual taste among the artisans of the band. Certain of them show preference for an arrangement of smaller design units on the basket walls. Others show a tendency to place a larger composite and symmetrical plant figure on the long side-wall and add smaller units as taste dictates. In such cases they are interpreted as unrelated single objects in nature. Those who combine the unit patterns into a synoptic whole, introducing both animals and plants into a scene which shows also some celestial phenomena, may be rated among the master designers of their community. Reference will be made to the feature of composition in the course of a few pages.

An observable characteristic of design location in the work of this group is the consciousness of need, in their esteem of beauty, to cover or disguise the "unsightliness" of seams. This is achieved by causing the decorative patterns to fall upon the seam spaces so that the stitches (in spruce-root material, of course) become the vertical center or midrib of an upright plant figure. The result makes the stitches and seams integrate into the decoration, becoming an adjunct instead of a detriment. A glance through the illustrations will furnish evidence of this. We might recall that Wissler in a study of the art principles of the Plains Indians focused attention upon a similar esthetic persuasion in the art of the Sioux.

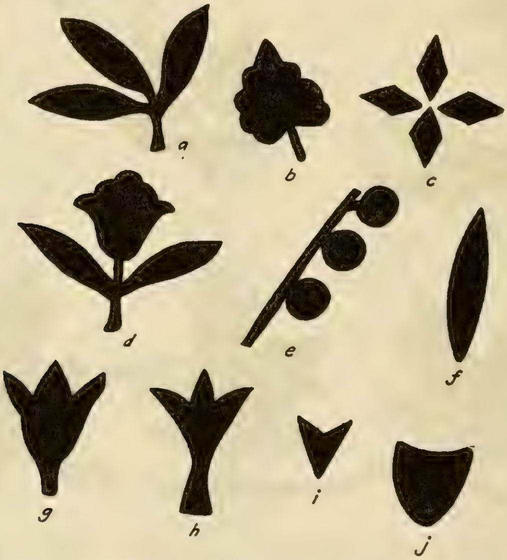

FIGURE 17.—Element designs from birchbark wall pocket (*a–e*), and birchbark cut-out patterns for decoration of containers (*f–j*) (River Desert Band) (MAI).

a, Leaves; *b*, blossom; *c*, little diamonds; *d*, blossom and leaves; *e*, wild cherries; *f*, leaf; *g*, *h*, blossoms; *i*, *j*, ornamental forms.

In the productions of the River Desert Algonquin the percentage of undecorated baskets and containers is relatively low. (See table of summary, p. 262.) This may be due to the more settled form of life of the band since the partial transformation of interest from hunting and trapping to farming began some 70 years ago. Proximity to whites has likewise to be considered. Specimens with undecorated sides but decorated lids are also in evidence. Lids or covers so ornamented usually show an arrangement of simple elements to form a whorl, the patterns being turned upon a center.

The treatment of designs in composition among Algonquin artisans also runs to landscape representation, resulting in a stylicism which approaches the first steps of pictography. This tendency may be expected for a people so closely approximating, historically and geographically, the cultural stature of the Ojibwa. The combination of animal and plant motives, with a smattering of celestial phenomena thrown in, comprises, in a certain proportion of the better decorated products, a panoramic display well suited to express the sylvan interests of such a people. On the sides of the larger baskets where space invites a display of ornamentation, animals in silhouette appear posed in portraiture in the varied staging of pond, marsh, and clusters of deciduous and evergreen growths, especially lilies (the cow lily, *Nymphaea advena*) and pitcherplants, with easily recognizable reality of form and of action. The panoramic totalities are appealing in meaning to the eyes of the Algonquin, depicting to him in visible form the vision of his sleeping and his waking moments—the Utopia of plenty for a hunting and trapping tribe. So it happens that landscapes of night as well as of day are laid out in composition on some of the containers. The distinguishing mark of night horizons is the presence of the star figure or the crescent moon above. The night scenes are strikingly realistic both in form and in concept, showing the familiarity of the artists with the activities of the wonderful animals chosen for portrayal—the bear, beaver, otter, deer. They stand out most vividly in the experience of the natives and seem to hold their place in the best achievements of their art. Without

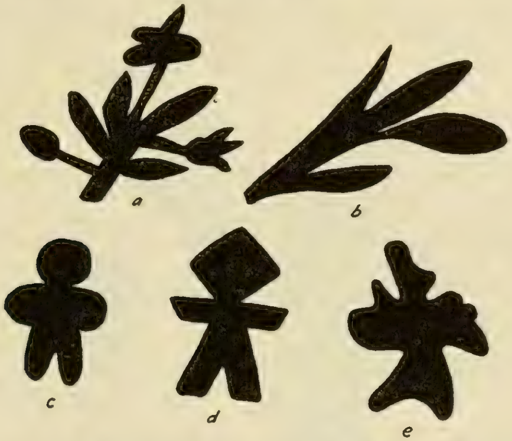

FIGURE 18.—Designs from sides of birchbark dishes (River Desert Band). Elements of decoration representing flowers and blossoms (MAI, NMD, UPM).

indulging in further discussion of the qualities of the woodscapes, a selection of examples will suggest for themselves what they may mean to their forest-minded makers. (See pls. 30, *d*, *e*, *g*; 35, *a*; 36; 38; and figs. 10, 11.)

In the following tabulation the salient features of Algonquin technique and design are summed up to conform with the purpose of this article, that is, the presentation of material from specific tribes to serve as a basis for future interpretative study.

TABLE 1.—*Summary of characteristics of birchbark container construction and decoration of various bands of Algonquin and neighboring groups*

Bands	Undecorated	Decorated	Exclusively animal figures	Animal and other figures	Human figures	Band floral designs	Rim reinforcement of birchbark	Etched design below rim	Painted decoration	Porcupine-quill decoration	Color scheme of rim wrapping	Geometrical figures	Simple flower elements exclusively
Algonquin bands:													
River Desert:													
Museum of the American Indian	20	26	----	----	----	3	4	18	----	----	----	----	----
National Museum of Canada	[1]32	5	----	----	----	3	----	1	----	----	----	----	----
University Museum	2	5	----	----	1	----	----	3	----	----	----	----	----
National Museum of Denmark	----	6	----	----	----	6	----	6	----	----	----	----	----
River du Lièvre:													
Museum of the American Indian	1	3	----	----	----	3	----	----	----	----	1	----	----
Mattawa:													
National Museum of Canada	----	3	----	----	----	3	----	3	----	----	----	----	----
Golden Lake:													
Museum of the American Indian	5	7	----	1	3	1	----	3	----	[2] 1	----	----	----
Timiskaming	9	12	2	3	----	----	----	5	----	----	----	----	----
Ojibwa bands:													
Timagami:													
National Museum of Canada	2	12	----	----	----	2	----	4	----	----	----	----	----
Museum of the American Indian	----	3	----	1	----	2	----	----	----	----	----	----	----
Private collection	----	8	2	2	1	4	----	----	----	----	----	----	----
Nipissing: [3]													
Museum of the American Indian	----	3	----	----	----	----	----	----	1	2	----	----	----
Depot Harbor: [4]													
Museum of the American Indian	8	----	----	----	----	----	----	----	----	([5])	----	----	----
Long Lac:													
Museum of the American Indian	----	7	----	----	----	----	----	1	----	----	----	4	2
Algonquin (1937):													
River Desert: [6]													
Denver Art Museum (and private collection)	10	35	0	7	26	24	2	14	0	1	1	3	9

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[1] The large number of plain forms here is due, according to Mr. Leechman's information, to their being a gift to the museum of newly made specimens of bark peeled in the summer, which is not suited to etching.

[2] Origin doubtful, dated from about 1840. Quillwork vaguely remembered by informant (information, F. Johnson).

[3] Collected by Dr. A. I. Hallowell, 1928.

[4] Collected by Frederick Johnson, 1928.

[5] Quantities of quill-decorated bark boxes are exported from this reserve to supply the trade. An enumeration of specimens of this type would not affect the problem, although quill decoration in early times evidently extended to this area.

[6] See footnote, p. 233.

Although at the present time of writing, studies of the art content of birchbark containers of the northern Indians have not progressed far enough to permit comparisons to be made, nevertheless something can and probably should be said since the printing of the material on Montagnais art in birchbark work (Speck, 1937). A few remarks summarizing the characteristics of decorations of this group may be made from an angle of comparison derived from the sources already available.

Unlike the Montagnais, the Algonquin workers I have observed in the present generation do not create the patterns for their designs so much from folded sheets of thin birchbark indented by the teeth. The Montagnais derive many of their symetrical patterns from these symmetrically unfolded impressions. The Algonquin depend more upon the cut-out figures trimmed with a knife or scissors in accordance with a visual image formed in the imagination or imitated from the observation of nature. (See p. 243.) Horizontal symmetry is produced by repeating the carving of the pattern to the right or to the left. Vertical symmetry (that is, where the design is repeated by turning the pattern up or down on its top or bottom) is not in evidence in the art of the bands dealt with here, so far as material warrants the statement. The cut-outs are both floral and animal. Floral suggestions are more in evidence among the eastern bands of

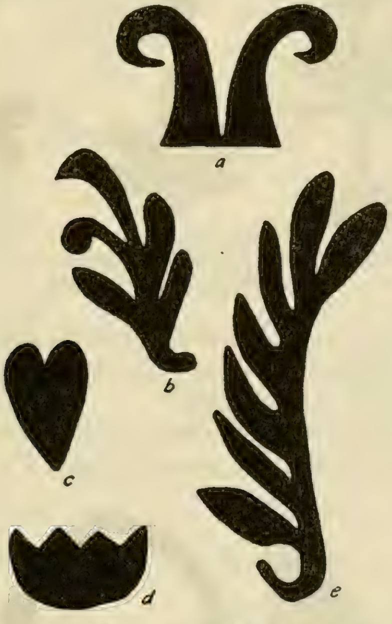

FIGURE 19.—Design elements from birchbark water pail (River Desert Band) *a*, "Toad's leggings," pitcherplant (*Sarracena purpurea*); *b*, *e*, leaves; *c*, heart; *d*, blossom of lily.

the group. Animal figures increase as one approaches the cultural strip nearer to the Ojibwa. I would infer from a general estimate of the evidence we possess that the animal figures are of prior dating to the floral motives. And that the latter are an acquisition, either having developed within the art horizon of the area as a natural outgrowth of internal stimuli or having resulted from imitation of other Indians or the French, is also highly probable. Knowledge of the absence or presence of surface decorations on bark containers of related and adjacent groups is now the lacking element in the art history of the northern Algonquin.

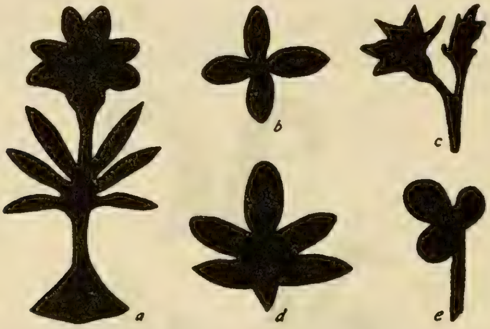

FIGURE 20.—Birchbark cut-out patterns for decorating containers, representing flowers (River Desert Band).

To theorize, furthermore, upon the possible sources of origin here for the tree and flower designs would call for a play of imagination hardly permissible in a report of this character. One need not, however, feel obliged to conjure up the remote past in the life of these forest denizens to seek for pointed suggestions in their functioning experiences amid daily and constant environment which would lead to the adoption of floral, especially leaf, devices in ornamentation. It is a real experience in the retina of European as well as native eyes to witness the mottled shadows cast by the rays of the summer sun

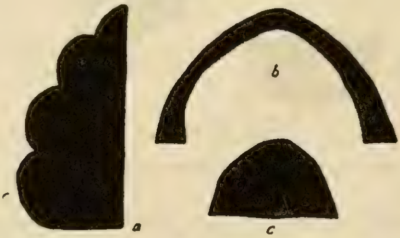

FIGURE 21.—Pattern stencils cut out of birchbark, used in decorating containers (River Desert Band).

a, Scallop for decorating center or corner of basket; *b*, arch or rainbow for side of basket; *c*, scallop element for decoration under rim of basket.

through the canopy of the leafy crown of the forest thrown upon the flat surfaces of objects lying littered about the camps. The Indians themselves are not oblivious to the shadowed silhouettes in the ceaseless panorama of sun-strewn patterns. In their contemplations, such displays of beauty have upon occasion been noted and the impressions voiced in my presence. Yet the association of leaf silhouettes with the origin of bark surface decorations still remains only a possible, if not a futile, suggestion of explanation emanating from the reasoning habit of the student—an unprovable hypothesis until "nature photography" shall disclose itself as a functioning concept of art[24] in aboriginal Algonquin culture history, be it ancient or modern.

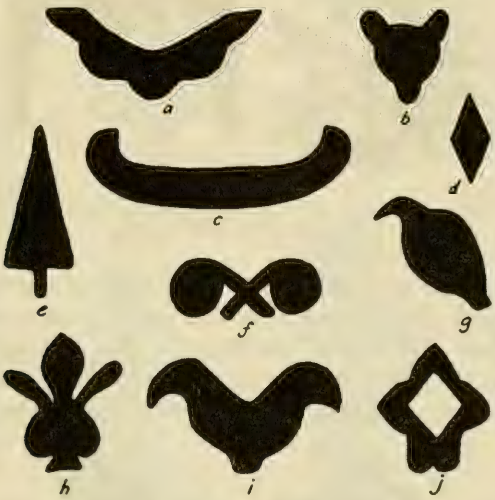

FIGURE 22.—Birchbark cut-out patterns for decorating containers, and designs taken from decorated objects (River Desert Band).

a, Arch (pattern for border design below rim); *b*, bear's head; *c*, canoe; *d*, diamond; *e*, tree (balsam); *f*, berries; *g*, pond lily; *h*, pond lily; *i*, *j*, flowers (unidentified).

The modest array of designs from this band upon which judgment has to be formed, permits an observation; namely that the integral floral or the forest landscape, as conceived in native eyes, is a characteristic. This seems to accord with the economic eminence of the great environing forest and its animal denizens expressed in totality (as in fig. 12, *a;* pls. 30, *b*, *d*, *e*; 31, *b*, *c*, *f*, *g;* 34, *f*). And so pictographic art expresses here in symbols the ecology of a Canadian Algonkian group.

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[24] Since the above was written I have examined the volume Reflections, by Mrs. Marian Thayer MacMillan (N. Y., 1936, p. 55), in which an interpretation of the "double curve" motif is proposed. The author of this remarkable hypothesis suggests derivation of the curve patterns of the northern Indians from native observations of plant reflections along the edge of still water. One cannot fail to be impressed by the author's logical views as supported by her text and illustrations.

The scenes are characteristically those of the food quest. In one, perhaps the highest flight of realistic genius of which these Indians are capable without instruction from the outside, we have the familiar and joyous event of late winter; the gathering of sugar-maple sap (fig. 10, *b*; pl. 30, *d*). This pictographic composition is reproduced from a spontaneously made water pail of bark, the seams pitched with spruce gum, in constant use in the family of Mikweni′n·i, "Willing Man." It stands for the idea which I have expressed with some persistence, that the forest dwellers of the "snowshoe hunting" culture possess a natural inclination toward an art tradition in decorating utensils in common use. Another theme construed in the style which may be called aboriginal so far as its conception and execution are concerned is the forest horizon in profile shown in figure 12, *d*. Two northern hares, their heads only showing above the hill, amid the tangle of a swamp, are portrayed realistically enough to excite interest in the eyes of hunters, whether natives or Europeans. Note also the dog chasing the partridge as a theme on a pail (fig. 10, *a*).

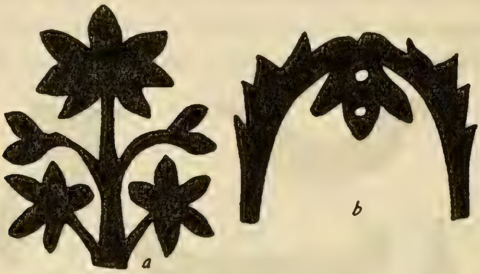

FIGURE 23.—Designs from one side and end of birchbark container (Mattawa Band) (NMC, III, L, 189).

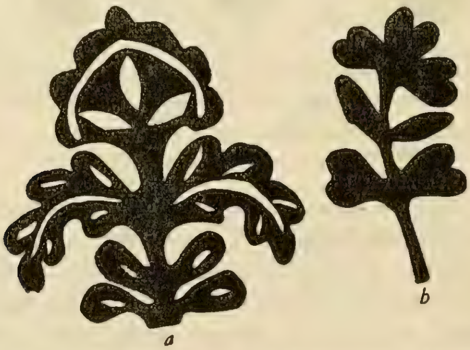

FIGURE 24.—Designs from birchbark containers (Mattawa Band).

a, Floral design in positive and negative technique (NMC, III, L, 189); *b*, floral design on side of small container (III, L, 191).

Similar judgment may be pronounced upon the bears symmetrically opposed under the arching tree in figure 11, *h*. The dominance of the feeling for symmetricism is here apparent in the composition of animal and tree silhouettes. Another conception of the forest night scene of vital meaning to these Indians is the representation of a goose on the lake shore, the crescent moon above, with the hunter's arrow on its way to its mark (pl. 36, *b*, cover of basket). Upon the sides of a cylindrical pail (pl. 31, *g*) are two graphic pictures, one an otter racing over the flats beneath the full moon, and, on the opposite side, two does at a stand facing each other beneath a drooping evergreen tree. Here again the symmetrical ruling of Algonquin composition has asserted itself. The otter scene just mentioned occurs twice on specimens collected from the River Desert Band. In plate 38 (upper figure) appears a duck represented advancing toward a blossoming pond lily. Above is a butterfly and a disk representing optionally the sun or the moon. The specimen is a sap pail. The

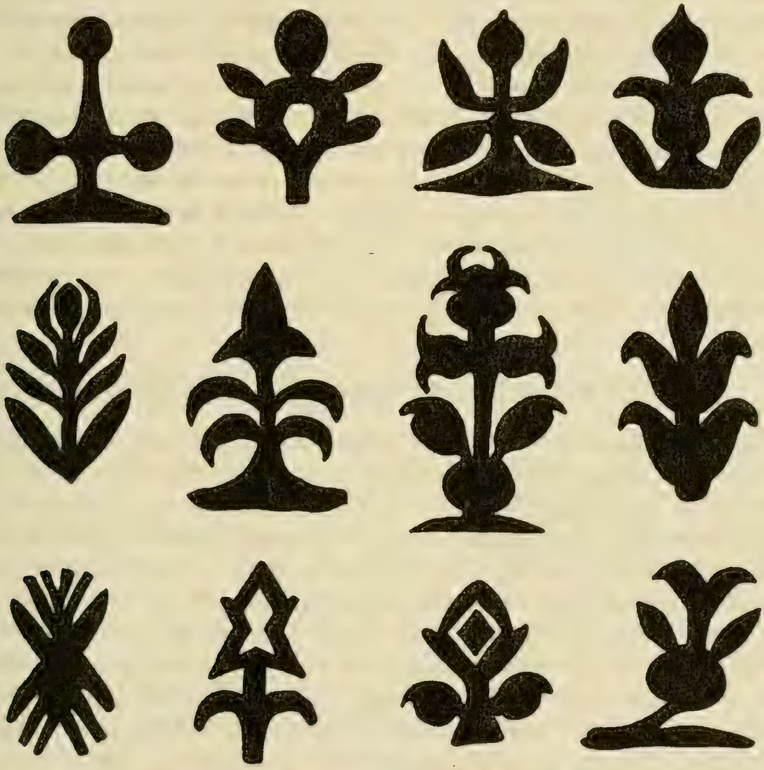

FIGURE 25.—Assortment of plant-design elements from sides and covers of birchbark containers derived from cut-out patterns, mostly pseudorealistic representations of yellow pond lily (River Desert Band).

lid of a pattern holder made by a girl of about 12 years of age (Anne Clement), at Maniwaki, betrays what seems to rank as a work of more sophisticated skill, namely, a single pyramidally-formed balsam rising above a firmament of five stars and crescent moon (pl. 38, lower fig.). Algonquin realistic intention is evident throughout. The beaver in his nightly activity of feeding and storing is a favorite topic of thought and portrayal in the north. The subject appears occasionally in the work of this band, as in three instances observed (pls. 34 *f;* 33, *a;* 36, *a*). Its treatment is fairly simple yet falls into the holographic category. The partly gnawed stem of a plant or tree is shown before the animal climbing over rocks on the border of his pond (pl. 36, *a*). In plate 35, *a*, appears a most pleasing arrangement of outline and contrast in a composition obtained by Mr. Patman from Madenine Cesar. It is scraped upon a large storage box made to protect her clothing and personal effects from misplacement in her camp. The subject chosen by her was a loon in flight above a setting of lake shore as stamped upon the memory of its creator. I dare not indulge in comment upon the quality of this composition more than to stress its appeal as well as its adaptability to the aims of modern decorative art.

THE CONSCIOUS ELEMENTS OF ALGONQUIN DESIGN MOTIVATION

To what extent the creation of animal and plant designs among the workers investigated is the result of deliberate intention, arises as a question to be weighed by evidence both objective and, as far as possible, subjective. Responses to efforts through questioning of several of the more active workers in birchbark showed that in producing animal and plant figures by means of cutting out the imaginary silhouettes, a conscious effort is made in the direction of portrait realism. Familiarity with plant forms in a multitude of varieties is a characteristic of woman's life in these bands. The traditional knowledge of curative properties of herbs, barks, and roots marks their personalities. The same is true of their experience with animal life. Small wonder that these influences should dominate the realm of creative illustration. One who considers the general aspects of design motivation among the Canadian forest tribes should also consider the importance of plant and animal beings in the milieu of environment. The past era of cultural development has been an era immersed in the influences of the woods—the "bush," in the vernacular of the north. Camp life, camp food, desires, associations of wide variety, induce thoughts by day and dreams by night centered about the denizens of the dark forests, the shimmering lakes, the barren *brulés*, and the waving marshes. These environments harbor both blessings and haunting terrors. Their effect is deeply registered upon the imagination as well as the daily-life horizon of the natives. An outgrowth of emotions determined by such influences resulting in productions of art form would seem to be inevitable.[25]

Where, we may ask, might a subconscious motive in phytozoomorphic representation be expected to appear in the art work of these groups? We might gain something by teaching ourselves to view the conditions with a freshness of outlook hitherto strange to ethnological trends of estimating the sources of native art inspiration. That there seems to be a suggestion of a hazy approach to subconscious rulings in the production of the *bitten designs* at least, is a point for consideration in an unbiased scrutiny of evidence. It requires an analysis of the purposes and practices of designing and of the feelings of the designers themselves for the outcome of their own habitual efforts. So far as the discussion of control factors in the making of the tooth-bitten decorative patterns has brought forth results, it may be said that the creators of these blind outlines do not profess to know just what patterns are to emerge from their teeth in most cases. There may be, indeed, a deliberate effort to mystify their art in the esteem of admirers when they profess to be moved by what we may consider as pure genius in discussing the matter. Yet there remains a shadow of accidency in the production of bitten designs attributable by one so inclined to subconscious influences. To what extent the profoundly personal emotions, and experiences of natives who have alternately suffered and reveled in the bosom of the wilderness, affect the forms of patterns produced by the teeth with eyes often closed and imagination actively functioning, we may never learn. To admit such influences, however, one would have to be a witness to the process. And that is not possible for contestants of the surmise just expressed. On the other hand, it is not the intention here to insinuate a surrealistic explanation of these instances of blind designing with the teeth. I should only add that those who are adept in the art of biting patterns, like Madenine Cesar, are widely known among their people and enjoy a reputation which could be rendered by our use of the term inspired. One would need to secure intimate personal histories of the few performers in the band. To obtain candid confessions from some of them by usual means would not be at all easy without courtship. The question raised in this paragraph is nevertheless fraught with interesting possibilities for investigation. I shall have to pass it on.

The question of religious symbolism in the designs discussed may arise as a possibility here. The matter was given some attention during the course of contact with the people. In no sense, however, can Algonquin decoration be construed into being a conscious religious document as might be the case in groups socially more complicated.

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[25] Incidentally, and to lend emphasis to the question of origin so often approached by students of native art, it seems to be as plausible to regard these deep-seated stimuli as indigenous provocations of design motives in the woodlands as to pronounce them summarily to be derived from European promptings. To dispense with the deeper motives of nature representation in Woodland Indian art in favor of the European derivation theory has become almost a habit in certain circles of thought.

CHRONOLOGY OF DESIGN

Confronting us constantly is the important question of the dating of decorations met with on these objects. It would be a most valuable addition to our knowledge of northern art history could we learn something from eighteenth century documents concerning the nature of basket designs of the area, or even as far back as a century ago. Here, as in the case of the Montagnais, however, early records have nothing sufficiently specific to say regarding birchbark wares and their decorations—topics too remote from the zeal-arousing subjects of soul salvation and education which engrossed the thoughts of missionary writers of the period.

For the contemporary art figures (flowers, leaves, animals, arch, etc.) there is nothing for us beyond native tradition of antiquity to pierce the haze of uncertainty surrounding the time and manner of their adoption and the sources from which they owe their derivation. Many of the River Desert specimens figured are modern, that is, made within the last 15 or 20 years. Some, however, have a known age of three generations (Petrullo, 1929, p. 227). Mrs. Buckshot, of River Desert, now in her seventies, the maker of a number of those illustrated, acquired her art from her mother without making any changes in the construction process or patterns of decoration of her bark work.

Knowing that the River Desert Indians prior to 1854 were resident at the Lake of Two Mountains Mission, and nearer by about 150 miles to the settlements on the St. Lawrence, we cannot evade the conclusion that European influence has been operating upon the esthetic development of these Indians. Indeed, the River du Lièvre Band shows such elaborate composition of its birchbark decorative figures, that the effect of French-Canadian farm life is only too apparent in the representations of flower pots and even bouquet groupings. The main difficulty is where to discriminate between native motives in the ornamentation of these old bark pails and the attempt to imitate European designs. While the critic may possess grounds for his own opinion on the question, it is evident that more material and especially more historical data will have to be obtained before the argument lurking beneath the surface will have been closed. It is apparent nevertheless, from what we know of the age, the economic character of the bark containers, and their decorations among these bands, that the craft they now represent dates back to the beginnings of the last century.

There is, however, another aspect of recent history of the basketry problem involved in the art craftsmanship of the River Desert Algonquin, if not that of the other bands as well. Among the older decorative techniques of this and the River du Lièvre Band we meet with an art process having deep significance in the understanding of distribution problems, namely the ornamentation of the splints of checkerwork baskets by applying stamp designs to the broad splints by means of cut-out "pattern blocks" made of potato, turnip, or wood. Discussion of this form of art is a topic in itself, for the outline of which we may await the results of a study by Miss Gladys Tantaquidgeon. The provenience of the "block" printing basket ornamentation carries us to the consideration of art over a wide area extending from the Delaware, Munsee, and Mahican of the middle Atlantic region across southern New England, Mohegan, Pequot, and Nehantic, and then, after a break in distribution presented by the Iroquois,[26] who do not stamp or paint patterns on their baskets, back to the upper St. Lawrence where the process appears again among the Algonquin. The interruption in distribution of this remarkable decorative technique, caused by its nonoccurrence among the Iroquois wedged between the two areas where it flourished, is, to my mind, tacit evidence that it belongs to a period of art evolution among eastern Alognkian-speaking tribes when they occupied an extent of territory in common, at a time prior to their dispersion northward and eastward through penetration of the Iroquois into their domain. Block stamping in basket ornamentation is, therefore, probably an extremely early native development among the eastern Algonkian peoples, and one which by some trend of migration was diffused northward to the later Algonquin proper. This has by now become blended with the primitive and natural decorative processes of a northern provenience, i. e., birchbark etching. It is, however, only with the latter that the present paper attempts to deal.

A consideration to be included in our examination of Algonquin art is the knowledge that the making of birchbark baskets has witnessed both a decline and an expansion within the last two generations. The use of such articles in the band fell off to its lowest level in about the last decade of the nineteenth century. Introduction of industry into the forest sections of Quebec caused a withdrawal of the Indians lying near the centers of industrial activity, luring them from exclusive hunting and trapping to pursuits of labor in the construction camps. The River Desert Band was one of those deeply affected by the change. Then came a feeble renewal of demand for the more esthetic forms of Indian labor. The women, on their part, found occupation in dull times and in winter in making birchbark and splint baskets for the more appreciative element of the incoming whites—the families of officers and staffs of the huge corporations. Contact with this class of Europeans had its results. The Indian of the "bush" encountered gentler white people at last who admired some of his gifts and accomplishments, and liked them. The discovery on the part of the latter that Indians could do something more than chop, drive, paddle, cook, sweat, and freeze in the "shanties" of the lumber and pulp operations created a spark of interest in the "inferiors." The discovery of native arts of delicate form, skillful technique and tasteful ornamentation, of the symbolic language of picture writing in the alphabet of beasts, flowers, and trees, brought out something that both races could understand. The Indians slowly responded to the new demand put upon their abilities. This time they drew upon a form of production which appealed to their woods-loving nature. And so, while it is true and should be emphasized that indigenous arts and crafts both useful and beautiful never completely ceased, there has been a revival. Native groups in other parts of the country have passed through similar transitions in the rise and fall of their folk-crafts. In the case of the Algonquin another generation will write the answer to the question of ultimate survival or extinction of a promising art inspiration born somewhere in the birch-forest depths of the circumboreal area.

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[26] Exceptions may be noted in the case of the Iroquois Oneida and Mohawk, who have produced these forms corresponding in design and technique to those of the adjacent Algonkian, from whom I believe they were acquired.

Interest in the construction and decoration of bark containers is aroused by the position they hold in the history and evolution of invention from the world point of view. Containers for dry and for liquid properties may be thought of as extremely early products of invention beginning with animal skin (rawhide) and tree skin (bark) folded wrappers and troughs of the simplest forms, some of which survive in use among hunting nomads of recent times. How can it be doubted that these products antedate in time and precede in technology the lengthy series of containers and holders which appear evolved through boxes, basketry, and bags in manifold form from the simplest to most complex forms often within the same areas? The porcupine-quill decorative technique on birchbark containers characteristic of the area among the Algonkian of the Great Lakes region, where it has reached such an efflorescent stage, has developed, as I conceive it, from the incised floral decoration on birchbark discussed in this and in related themes of treatment.

It seems a proper time for a more critical, even reformistic attitude to be taken toward treatment of historical as well as functional aspects of native American art.

In a recent paper on Montagnais art in birchbark (Speck, 1937) I have evaluated certain evidence as set forth by commentators to prove European derivation of the floral and curve motifs so characteristic of design styles of Algonkian peoples of the Northeast. To many ethnologists this deduction may seem right in a superficial sense. In a profound sense, however, such an assumption in the guise of a conclusion is a delusive one. Yet it has swayed the arguments propounded in treatises which constitute in most instances secondary sources. The review and analysis arranged in the discussions just concluded should mean something in the future understanding of what these nature associations (flora, fauna, and hunter's visions of landscapes) stand for among groups culturally environed in the ecological set-up of the Canadian life zone. To stress social factors of art culture, thereby thrusting aside a realization of what force is exerted by environmental conditions of nature, I am sure is to betray obstinate disregard for a great functioning influence. To drag in and stand up the historical art dummy of modern European origin in this case is subserving a sickly and overworked tradition of nineteenth century American ethnology. Someone may yet desire to attribute the pattern-biting process to as mythical a source as the old woman who bit holes in Swiss cheese with her one tooth, or perhaps to trace the Algonquin method of fashioning thongs from a single moose hide by spiral-centripetal trimming to Dido and the classical cutting of the bull hide! The material discussed in my several recent papers may at least inaugurate a contest of opinion with new bearings upon a subject of art which some of our profession have regarded as closed.

It would seem, furthermore, that these nations of the woods had already started a few steps along the way leading to the formation of a crude scriptural system, at least as far as pictorial representation of object and idea might so be regarded. The symbols having values of floral glyphs, partially developed into curve ideograms, passed into use as fixed outline forms. Their wide range of significance pictorially embraces those most important elements of life and environment. They rise in the scale of literate culture traits, even to the extent of being carved upon the faces of blocks employed as stamps, whence they acquire the character of block designs constituting a process of elementary printing with a color (ink) medium. If it seems presumptuous to lift these developments to such a high cultural rating in favor of a crude civilization, how may they be otherwise described? I shall take occasion subsequently to show in another paper how the block printing of designs was effected in the decorative art composition of other Algonkian groups of the Northeast (Munsee, Delaware, Mahikan, and the early southern New England peoples), a distribution which points toward a locus of specialization in art history that may be said to own some conventionalized type-forms for representation of ideas. May we not then boldly but justly call it an initial step on the part of Algonkian hunters in the production of an elementary system of writing and block printing amid an environment of uncleared forests?

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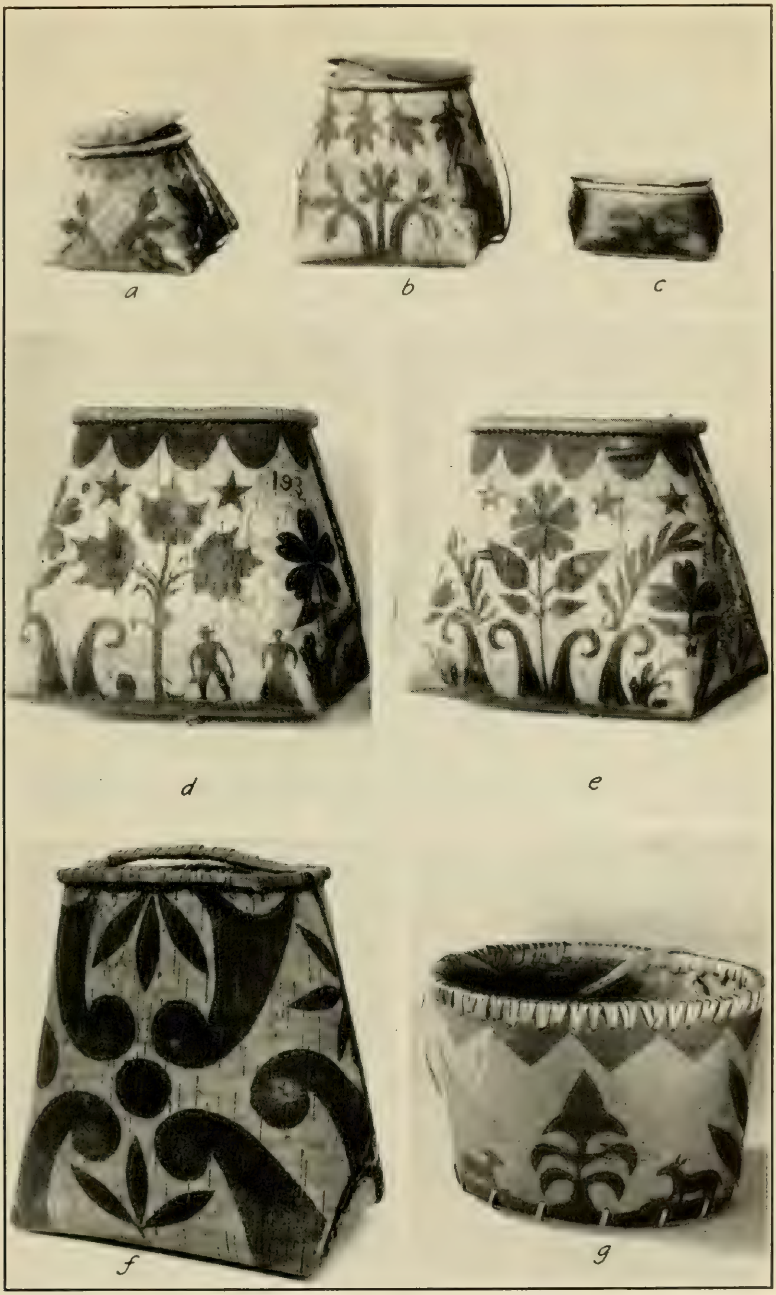
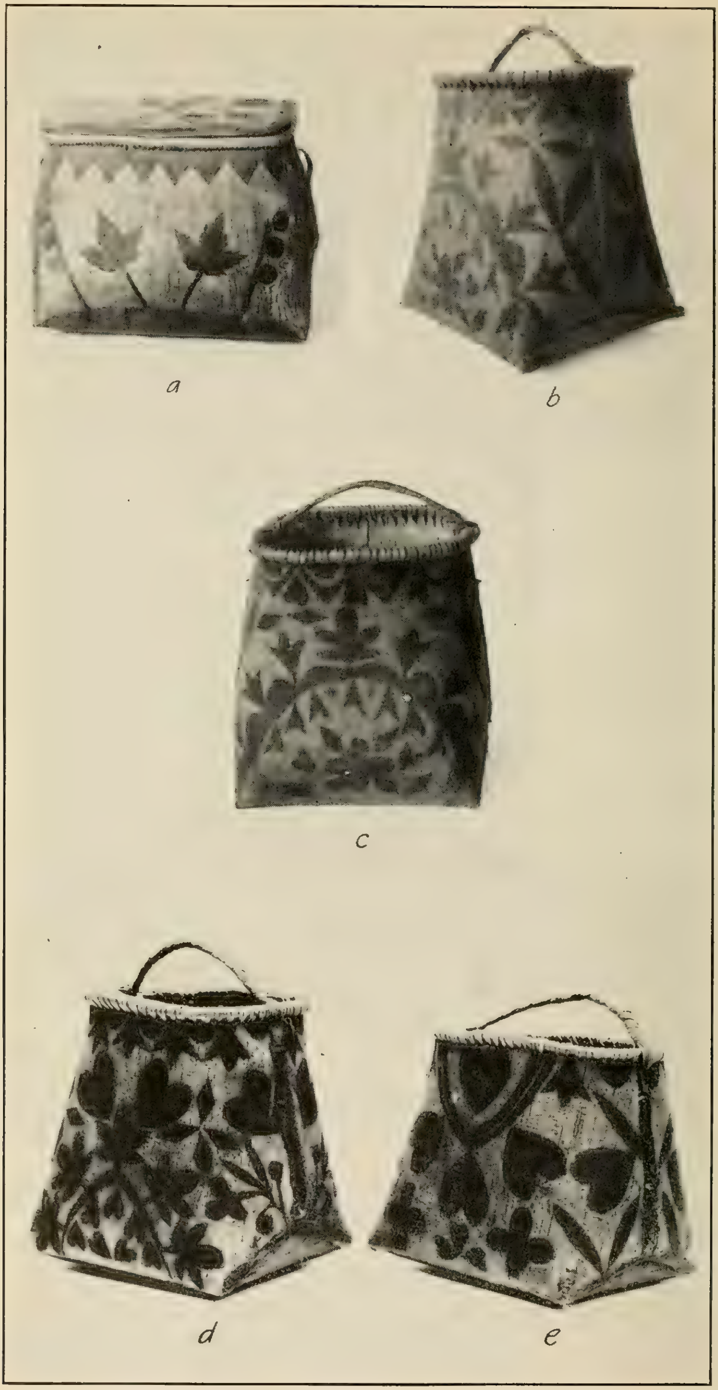


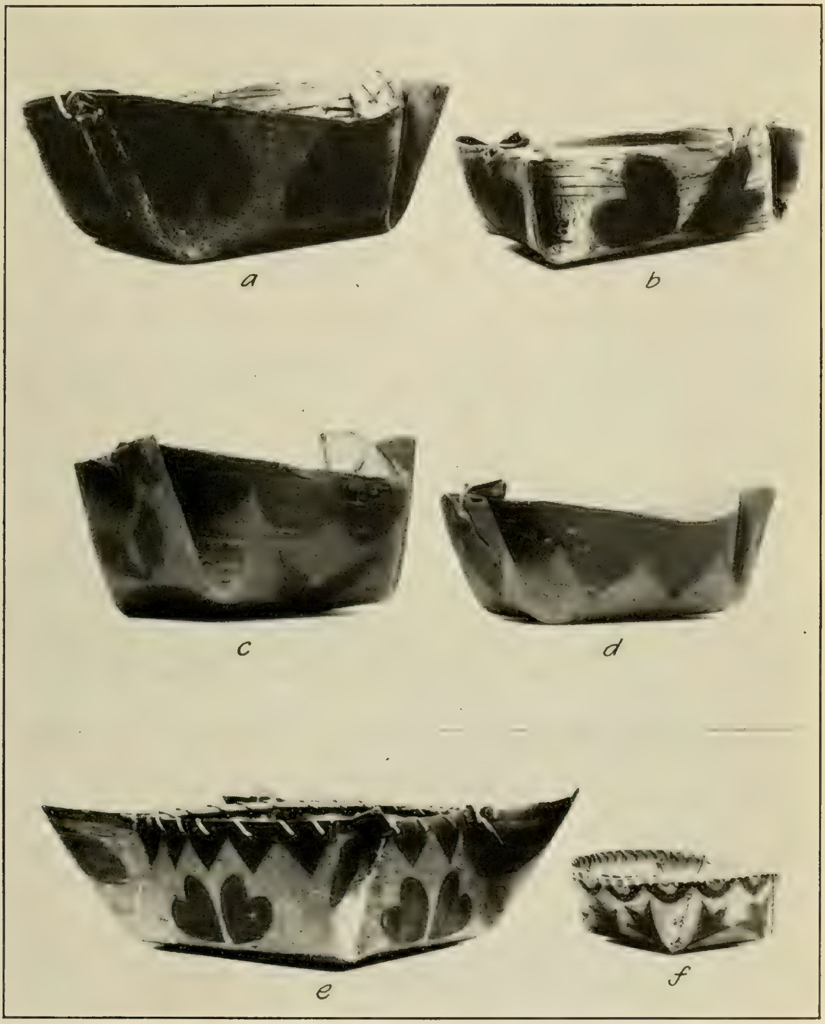
BIRCHBARK CONTAINERS, SAP BUCKET AND ROUND PAIL (RIVER DESERT BAND) (NMC).

a, *b*, *c*, Containers with similar designs on both sides; *d*, *e*, opposite sides of same bucket, scene of activity in sugarbush (MAI, 11×12 in.); *f*, birchbark pail for maple sap or water (River Desert Band), 13½ in. Designs represent "frog's leggings," pitcherplant (*Sarracena purpurea*), and leaves (MAI, 15/3068); *g*, round pail for household possessions, tools, work material, etc. (height 12 in.). Designs depicting night scene in woods, deer under tree.



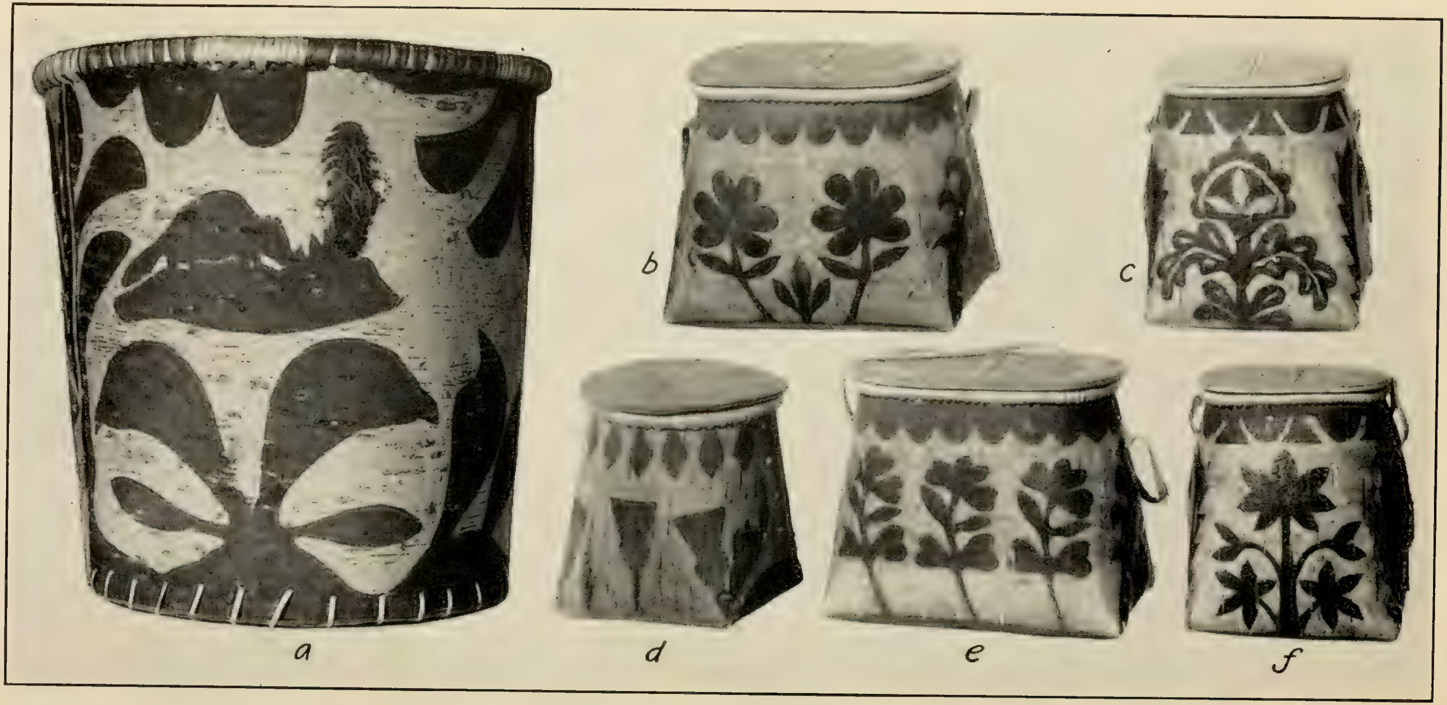
BIRCHBARK CONTAINERS (RIVER DESERT BAND).

a, Workbox, 8×10 in. (both sides are the same) (MAI); *b*, *c*, maple sap pail (Rochester Municipal Mus.); *d*, water or sap pail, height 11⅝ in. (MAI, 16/1595); *e*, water or sap pail, height 10 in. (MAI, 16/1596). Both have seams closed with pitch.



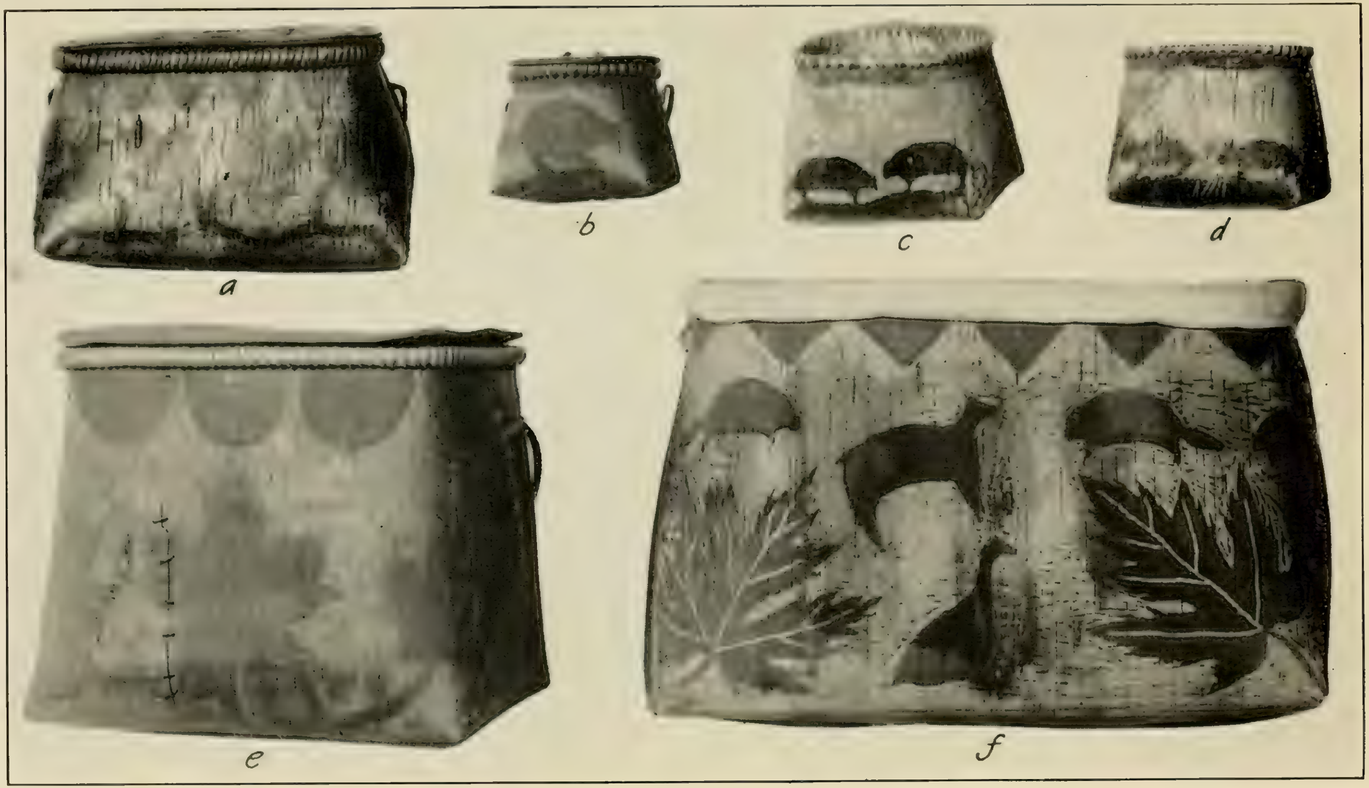
BIRCHBARK SAP PAILS AND DISHES (RIVER DESERT BAND).

a, *b*, *c*, *d*, Sap pails, height 4½ in. (MAI, 16/1613–16/1616); *e*, large sap container, height 5½ in. (16/1612); *f*, dish, height 3 in. (16/1597).

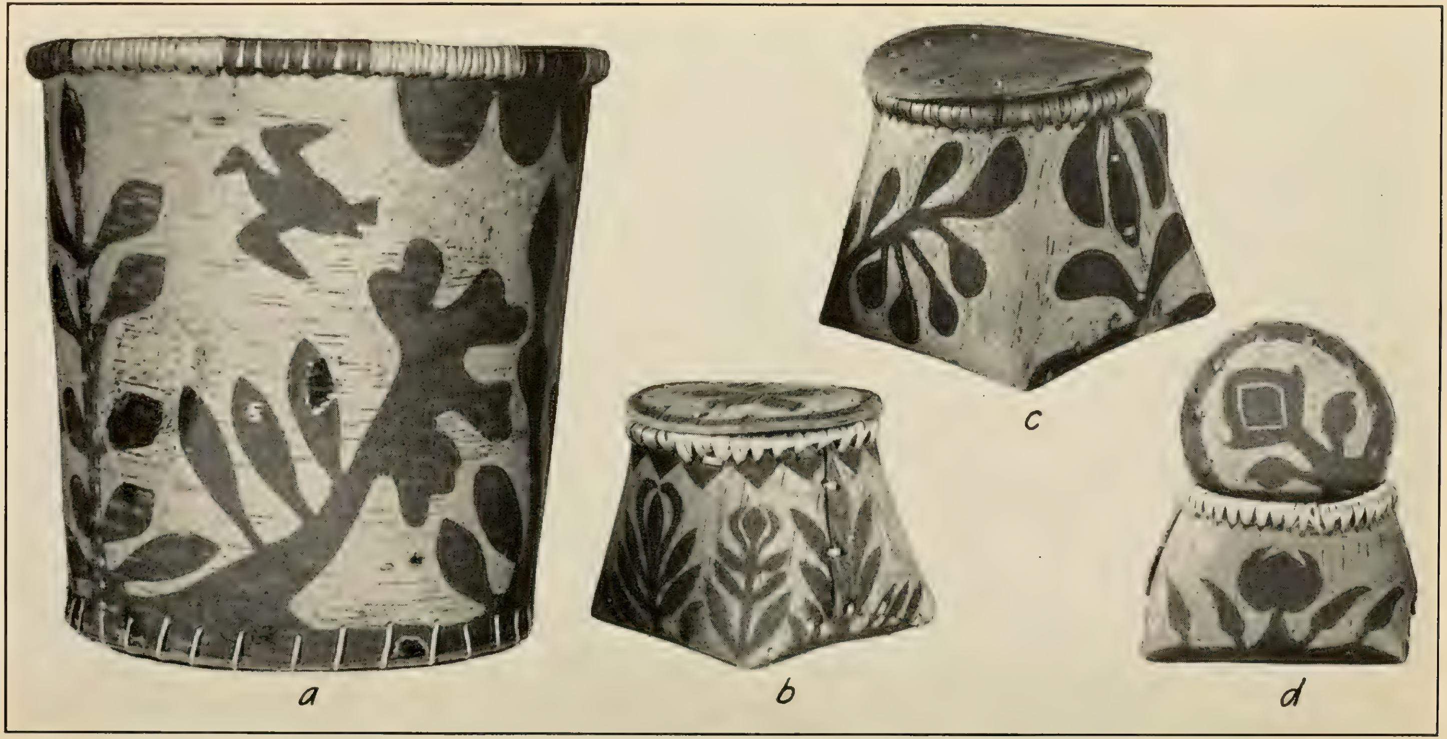


BIRCHBARK TRUNK AND BASKETS.

a, Algonquin birchbark storage trunk, sewed with spruce roots (18×18 inches). River Desert Band (DAM, CAI–2–P). (Photograph by Wm. F. Patman. Collected by F. G. Speck.) *b–f*. Birchbark baskets (Mattawa Band). *b*, *e*, Two sides of same specimen; *c*, *f*, two sides of same specimen (NMC, III, L, 189, 190, 191).

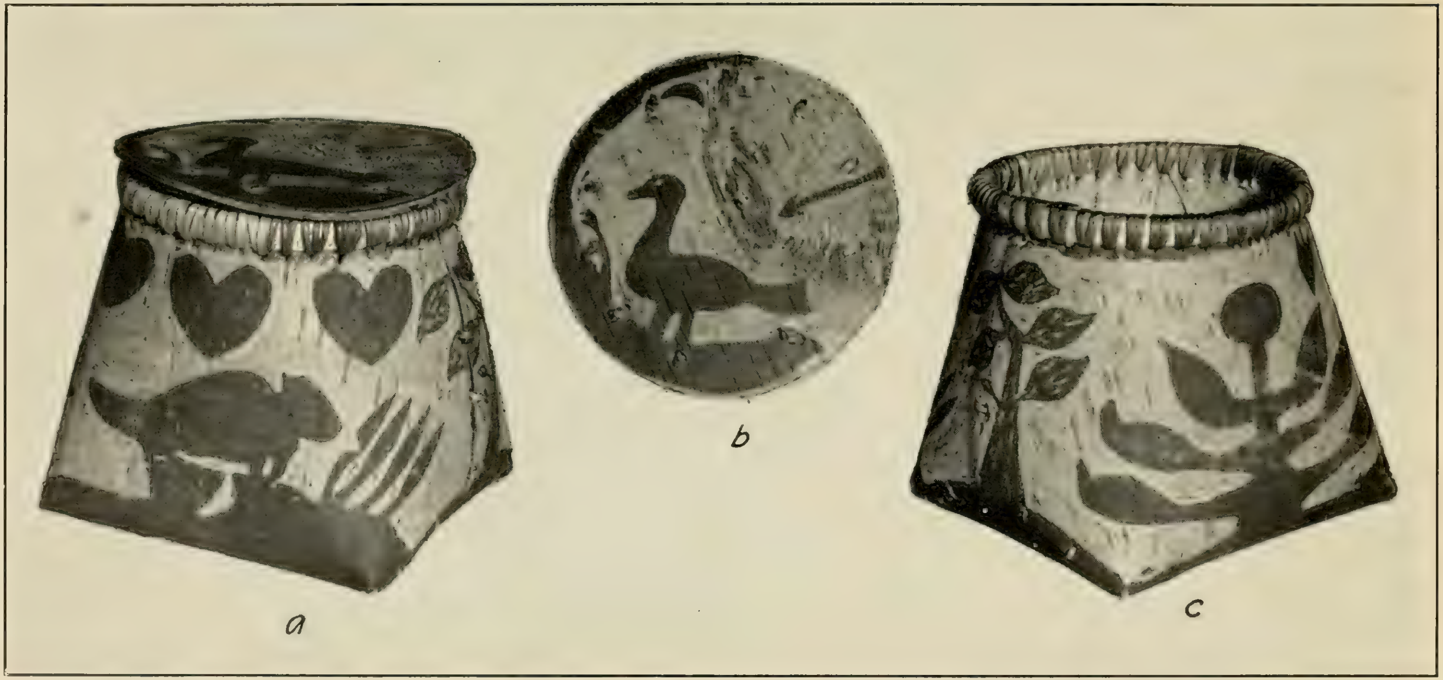


Decorated Birchbark Containers (Timiskaming Band, Algonquin).
a–f, NMC, III, L, 100, 102–4, 108.



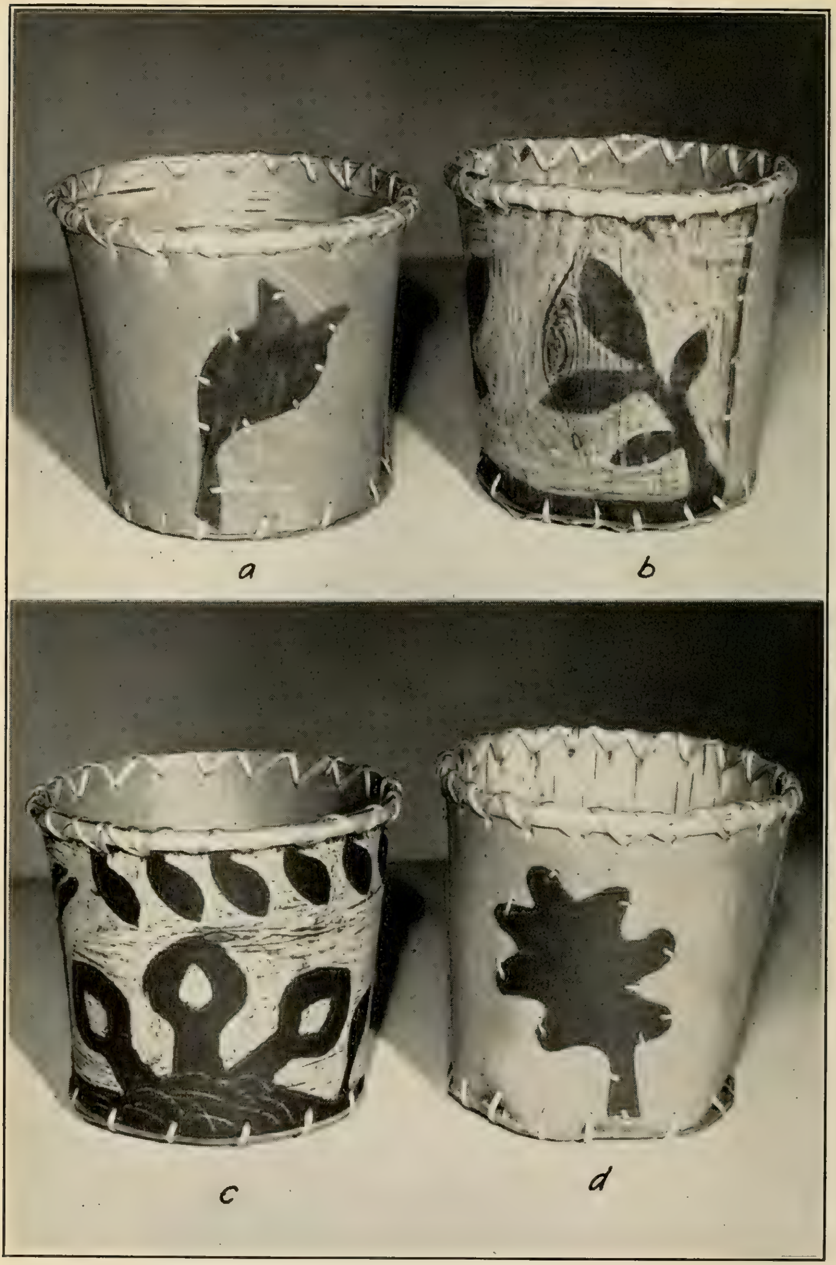
ALGONQUIN BIRCHBARK CONTAINERS (RIVER DESERT BAND). (DAM, CAI-2-P).

a, Large storage container (18×18 in.), scene of lake shore with loon in flight; *b*, *c*, *d*, containers showing swamp scenes with lily growths. (Photographs by Wm. F. Patman.)



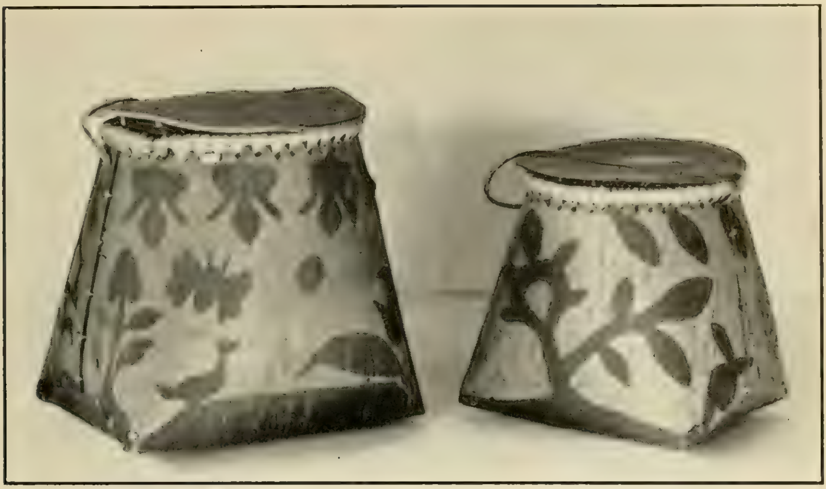
ALGONQUIN BIRCHBARK BOX WITH SCENE OF BEAVER GNAWING VEGETATION, BAND FLORAL DESIGN ON SIDES AND DUCK BEING SHOT WITH ARROW AT NIGHT; BOTH SIDES OF SPECIMEN (HEIGHT 5 IN.).

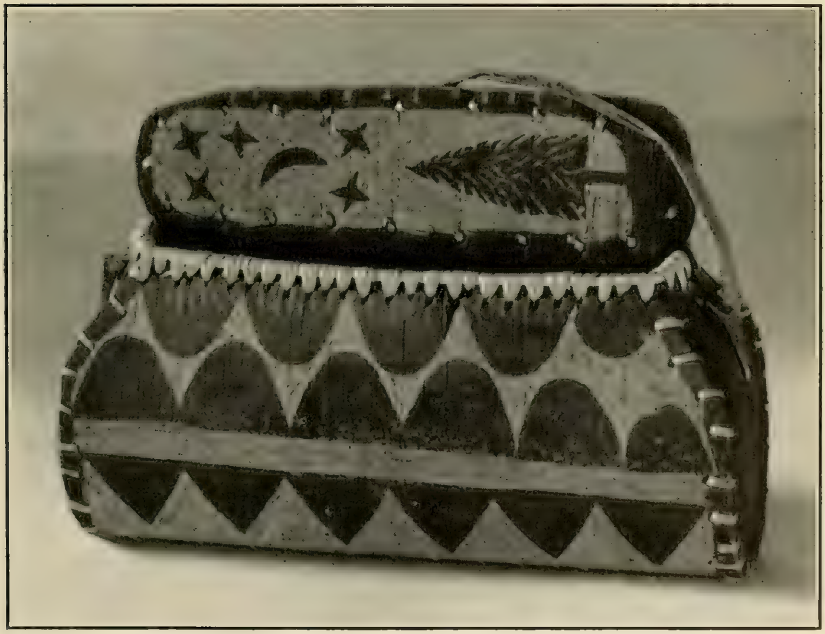
(DAM, CAI-2-P.) (Photograph by Wm. F. Patman.)



ALGONQUIN BIRCHBARK CONTAINERS FOR HOUSEHOLD ARTICLES WITH FLORAL FIGURES IN SGRAFFITO DESIGNING AND WITH SEWED-ON CUT-OUT PATTERN DECORATIONS.

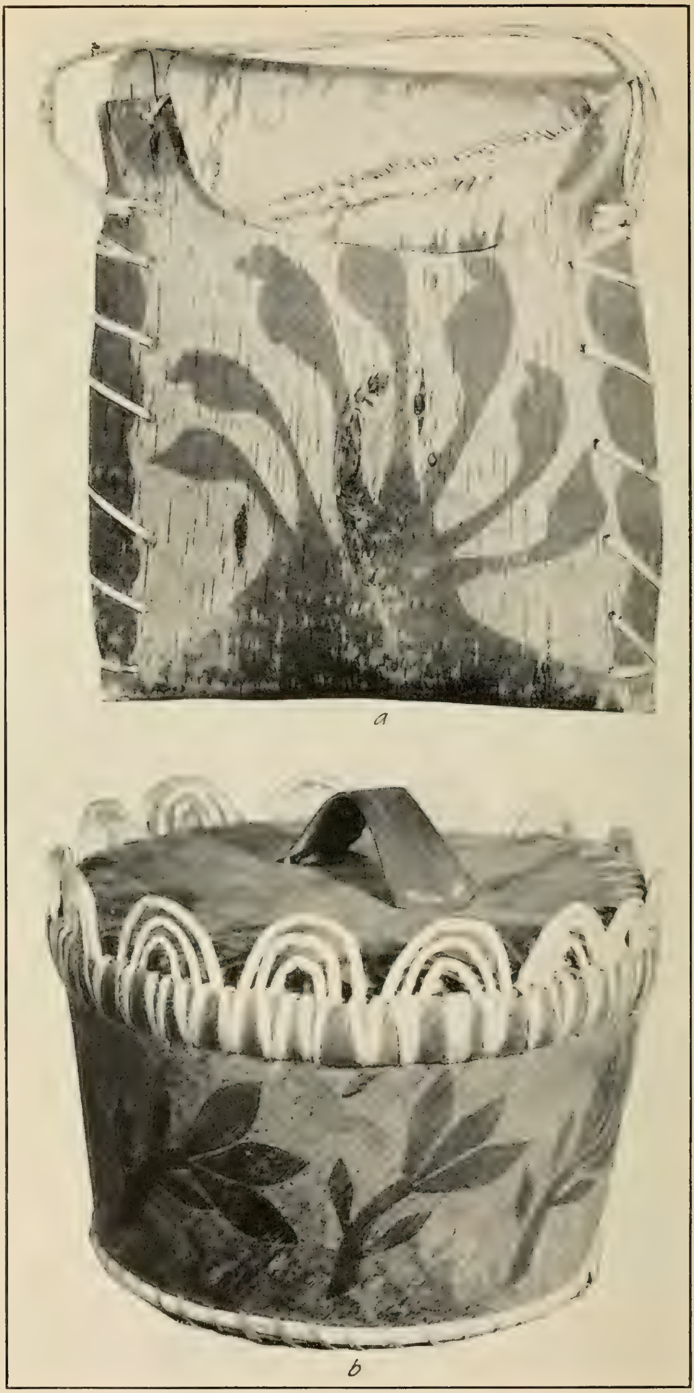
Both sides of two vessels shown (6×6 in.) (DAM, CAI–II–P). (Photograph by Wm. F. Patman.)





Birchbark Containers (River Desert Band).

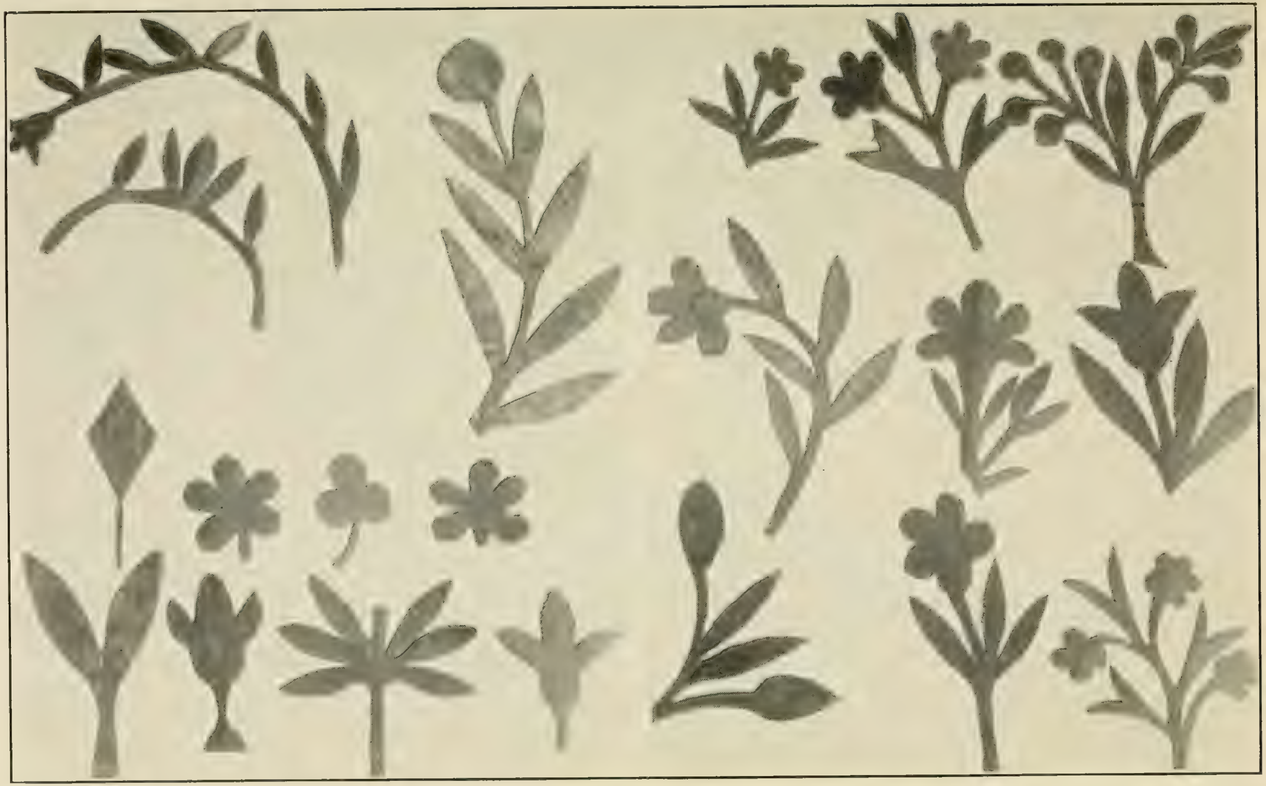
Upper, decorated containers, night scene, duck, moth, or butterfly and moon on edge of lake; *lower*, decorated container for woman's possessions, sewing materials, cut-out and bitten patterns, with forest night scene on lid (10 in.) (DAM, CAI–14–P).



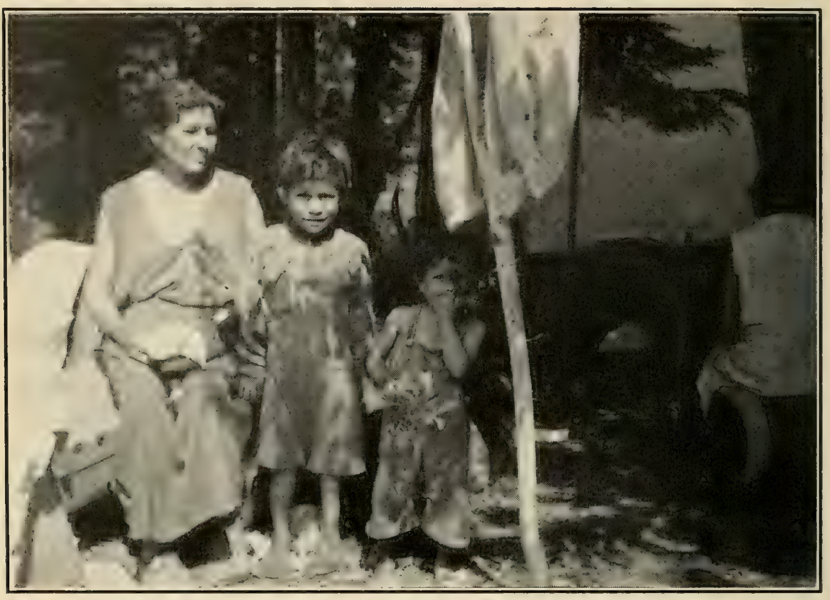
BIRCHBARK CONTAINERS.

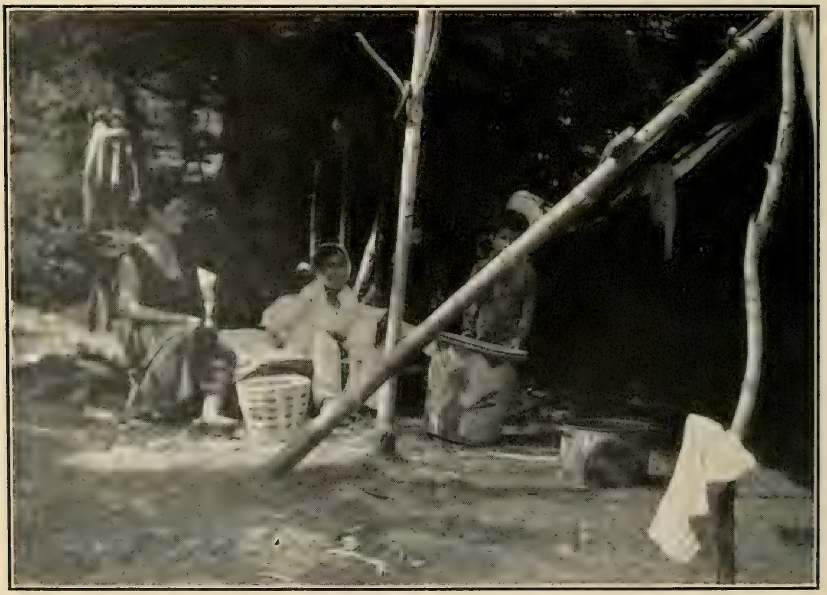
a, Birchbark envelope container for bear bait, with pitcher-plant figure, 9½ × 11 in. (River Desert Algonquin, P. Q.) (DAM, CAI–16–P).

b, Birchbark container with spruce-root loops for decoration on rim, 5¾ × 4½ in. (River Desert Band) (DAM, CAI–12–P).

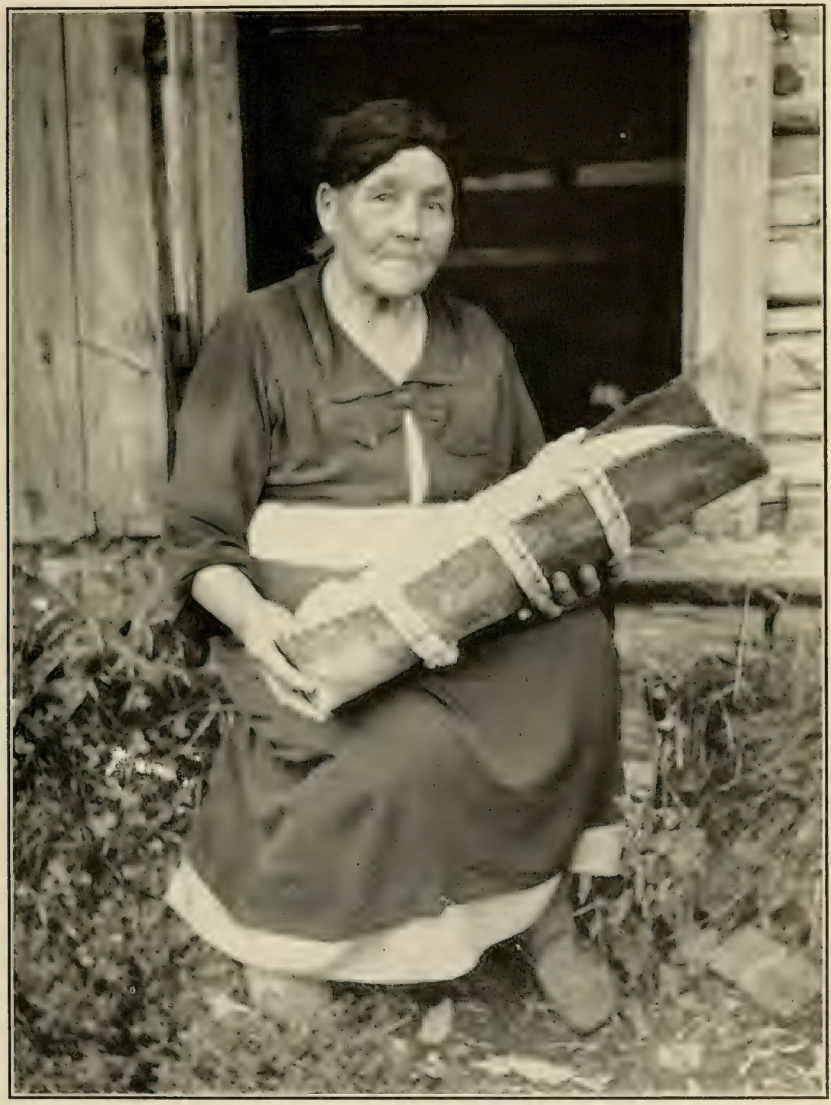


Birchbark Cut-out Pattern Markers for Decorating Bark Containers Representing Undefined Varieties of Flowers and Leaves (River Desert Band) (MAI).





Camp of Algonquin Birchbark Worker and Basket Maker (Madenine Cesar) (River Desert Band, P. Q.).



MÁCKUSI·'K·WE, "BEAVER MEADOW WOMAN," (MRS. M. BUCKSHOT) WITH DECORATED BIRCHBARK BABY CARRIER FOR INFANT UP TO ONE MONTH OF AGE. (SPECIMEN IN NMD, 1938.)

SMITHSONIAN INSTITUTION
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Archeological Reconnaissance of Southern Utah

By JULIAN H. STEWARD

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ARCHEOLOGICAL RECONNAISSANCE OF SOUTHERN UTAH

By Julian H. Steward

INTRODUCTION

Archeological investigations by Judd (1926) and by the present writer (Steward, 1933, 1933a, 1936) in the Northern Periphery of the Southwest, that is, in northern and western Utah, had revealed numerous remains of a prehistoric culture the main features of which were derived from the Anasazi or Basket Maker-Pueblo cultures of the San Juan River drainage. But whereas the cultures of the latter area are known to have developed through at least four comparatively distinct chronological periods—Basket Maker (II), Modified Basket Maker (III), Developmental Pueblo (I and II), and Great Pueblo (III)[1]—present data indicate but two periods in the Northern Periphery. Neither true Basket Maker nor Modified Basket Maker is present. The early period, though Basket Maker in such features as ceramics and stress on clay figurines and anthropomorphic petroglyphs (which largely faded out in the San Juan Pueblo cultures), already contains some Developmental Pueblo elements, especially a jacallike pit lodge. The late period merely brought the addition of such San Juan Pueblo II elements as rectangular houses, intensive horticulture, ceramic features, and probably some brachycephalic people. In the entire portion of Utah which lies north of the Fremont River in the east and which falls within the Great Basin in the west, only these two periods are known.

The outstanding problem of the Northern Periphery, therefore, was to discover the place and manner in which those culture elements which had been chronologically differentiated in the San Juan area had become blended into a single culture and spread northward into the Northern Periphery. Theoretically, there should be found a region with the two following cultural stages: First, a Modified Basket Maker culture lacking any Pueblo influence; second, a culture retaining certain elements of the first (which, in the San Juan area, faded out after the close of the Basket Maker periods) but having in addition certain early Pueblo elements. Work by Judd (1926) and

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[1] These terms are from Roberts (1937). Numerals in parentheses refer to the old terminology, i. e., Basket Maker II, III, etc.

Nusbaum (1922) had shown that the cultures in the vicinity of Kanab in southern Utah were chronologically differentiated much as in the San Juan area, which ruled out that region as the source of the special Northern Peripheral culture.

In order to shed light on this problem as well as to explore areas which were blanks on the archeological map, the writer undertook two trips in southern Utah in 1932 for the University of Utah. One trip was made in company with B. O. Hughes of Ann Arbor, Mich., R. F. Hosmer of Los Angeles, Maurice Howe of Salt Lake City, and Delbert Riggs of Kanab, Utah. Traveling with pack outfit, the party thoroughly explored the region of the lower Paria River and Johnson Canyon, east of Kanab. The observations made on this trip form the first part of this paper.

The other trip was made in company with Hughes, Charles Kelly of Salt Lake City, and Hoffman Birney and John Shoemaker of Philadelphia. It was only through sharing expenses with the last three that the expedition was possible. Traveling by boat, 23 days were spent exploring Glen Canyon of the Colorado River between the Fremont River in central-eastern Utah and Lee's Ferry in northern Arizona. Description of the archeology of this region forms the second part of the paper. The writer wishes to express gratitude to his companions on both trips, particularly to Hughes, who assumed responsibility for much of the reconnaissance on the second trip.

The archeological collections obtained are in the Museum of Anthropology at the University of Utah. Numbers of specimens recorded in this paper are those of the museum catalog.

PART 1. THE JOHNSON CANYON AND PARIA RIVER REGION

SITES VISITED

The lists of sites visited follows. The numbers refer to those on the map.

Site 1.—Mouth of Molly's Nipple Canyon. Petroglyphs and plain pottery, probably Basket Maker.

Site 2.—1½ miles west of Potter's ranch. A large cave with three circular houses, having slab foundations and adobe, straw, and horizontally laid rocks above; two were excavated. Artifacts: Mostly plain and black-on-white sherds. A few sherds of corrugated ware and of unbaked clay; metates and mullers. Site is early (pls. 43, 44).

Site 3.—½ mile south of Potter's ranch. No architecture. Sherds like those of site 2.

Site 4.—1½ mile south of Potter's ranch. Three masonry cliff houses. Corrugated and black-on-white sherds. Petroglyphs in one cave.

Site 5.—100 yards south of site 4. Plain sherds scattered on hillside.

Site. 6.—200 yards south of site 5. Plain sherds and small slab cists.

Site 7.—South side Molly's Nipple Canyon, ¼ mile south of Kitchen cabin. White animal and anthropomorphic pictographs in rock shelter.

NEV.
Kanab
Virgin R.
Kanab R.
ARIZO
Wildcat Cañon
Kanab Cañon
33
19
28
27
23
24
45
25
26
58
31
10
7

iver r

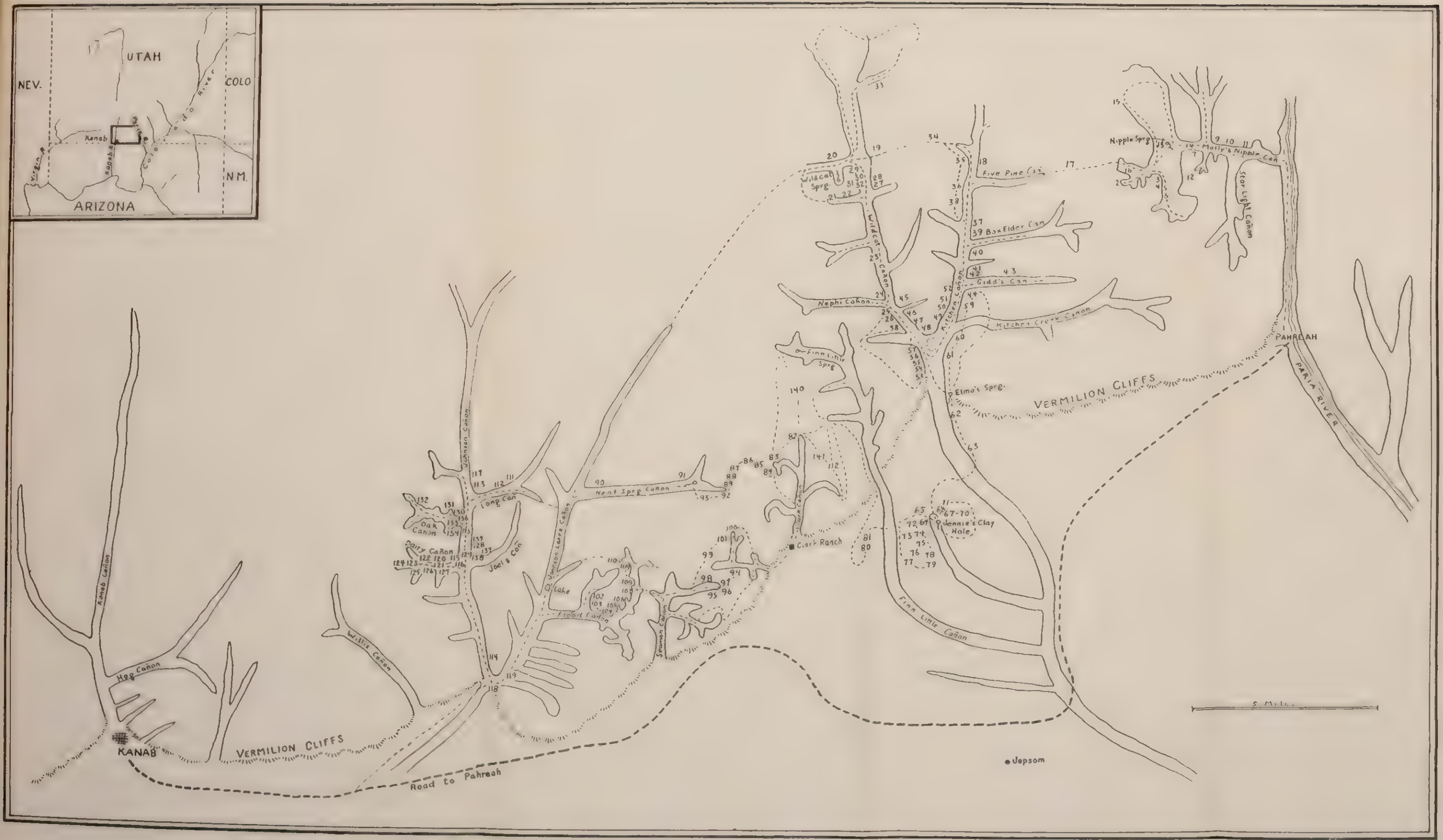

UTAH
NEV.
COLO
N.M.
ARIZONA
Kanab
Colorado River
Virgin R.
Kanab Creek
Paria
Wildcat Sprg.
Five Pine Cañ.
Nipple Sprg.
Molly's Nipple Cañ.
Star Light Cañon
Box Elder Cañ.
Gidd's Cañ.
Nephi Cañon
Wildcat Cañon
Kitchen Cañon
Kitchen Creek Cañon
PAHREAH
PARIA RIVER
Finn Little Sprg.
Elmo's Sprg.
VERMILION CLIFFS
Jennie's Clay Hole
Clark Ranch
Finn Little Cañon
Johnson Cañon
Neat Sprg. Cañon
Long Cañ.
Oak Cañon
Dairy Cañon
Joel's Cañ.
Johnson Lakes Cañon
Lake
Flood Cañon
Seaman Cañon
Kanab Cañon
Hog Cañon
Willis Cañon
KANAB
VERMILION CLIFFS
Road to Pahreah
Jepsom
5 Miles

FIGURE 26.—Sketch map of the Johnson Canyon–Paria River region.

218558—40 (Face p. 282)

Site 8.—Head of canyon, directly opposite (south of) Kitchen cabin. Cave with one crude circular stone house.

Site 9.—Back of Averett's cabin. Late sherds and traces of houses.

Site 10.—½ mile east of site 9, on promontory formed by Molly's Nipple Canyon and small side canyon. Sherds and stone "hoes" collected.

Site 11.—Cave just under rim rock between sites 9 and 10. Traces of stone walls.

Site 12.—Cave at head of draw, southwest of Kitchen cabin. Plain sherd collected.

Site 13.—Potter's ranch. Sherds and stone hoes scattered over sand hills.

Site 14.—Molly's Nipple Canyon just below Potter's ranch. Stone hoes and sherds in canyon bottom.

Site 15.—1½ mile northwest of Riggs' ranch. Paria gray sherds in cave.

Site 16.—¼ mile east of site 2 where trail to Kitchen cabin leaves main canyon. Sherds and flints scattered on hillside.

Site 17.—West of summit of trail from Molly's Nipple Canyon to Five Pines Canyon. Plain sherds and flints scattered on waterless flat.

Site 18.—East side of Kitchen Canyon, ½ mile north of Five Pines Canyon. Traces of stone and adobe walls. Plain and corrugated sherds (pl. 45, *a*).

Site 19.—On hillside where trail drops into Wildcat Canyon opposite Wildcat Spring. Plain sherds.

Site 20.—⅛ mile north of Wildcat Spring. Two small caves with traces of stone and adobe walls. Plain and corrugated sherds.

Site 21.—1 mile south of Wildcat Spring at head of small canyon running east into Wildcat Canyon. Paria gray, and Basket Maker black-on-gray sherds.

Site 22.—North side same canyon, ¼ mile east of site 21. Small rock shelters containing layers of cedar bark, pine needles, and sand. No artifacts.

Site 23.—West side Wildcat Canyon, sandy knoll north of Nephi Canyon. Plain and corrugated sherds, metates, and mullers.

Site 24.—North side mouth of Nephi Canyon. Sherds and arrow points.

Site 25.—South side of mouth of Nephi Canyon. Remains of masonry and cists; abundant sherds of late types. Also metates and mullers.

Site 26.—200 yards south of site 25. Remains of slab cists on hillside; sherds.

Site 27.—East side Wildcat Canyon opposite canyon with sites 21, 22. Two caves with evidence of occupation and a semicircular stone and adobe granary under ledge near top of cliff.

Site 28.—¼ mile north of 27, east side Wildcat Canyon. Cave with water seep containing 18 inches of stratified ash and flint chips.

Site 29.—West side Wildcat Canyon, ⅛ mile south of Wildcat Spring. Rock shelter with pictographs in white, cream, and black.

Site 30.—300 yards south of 29. Cave containing corrugated and plain sherds.

Site 31.—Above site 30. Small cave walled up to form granary.

Site 32.—100 feet south of site 30. Rock shelter with late sherds and flints.

Site 33.—½ mile north of site 30, in draw on east side Wildcat Canyon. Rock shelter containing sherds and flints.

Site 34.—West side of Kitchen Canyon, 200 yards north of Five Pines Canyon. Sherds and flints scattered over small knoll.

Site 35.—Opposite Five Pines Canyon. One metate and flint chips.

Site 36.—300 yards below site 35, west side of canyon. Occupied cave with flint chips.

Site 37.—East side Kitchen Canyon, 200 yards north of Box Elder Canyon. Caves and rock shelters containing masonry walls, also circular stone and adobe house (pl. 45, *d*).

Site 38.—West side of Kitchen Canyon, 200 yards north of site 37. Rock shelter containing charcoal and worked flints.

Site 39.—Junction of Kitchen and Box Elder Canyons, a knoll covered with nine slab cists, traces of more cists, sherds.

Site 40.—½ mile south of site 39. Petroglyphs and pictographs in white.

Site 41.—Kitchen Canyon, ¼ mile north of Gidd's Canyon. Knoll covered with 13 or more slab cists and houses. Sherds collected.

Site 42.—North side of mouth of Gidd's Canyon. Knoll covered with approximately 13 slab cists and houses. Sherds and metate collected.

Site 43.—North side of Gidd's Canyon, 250 yards from mouth. Flint workshop on small hill.

Site 44.—Hill, junction of Gidd's and Kitchen Canyons, south side mouth Gidd's Canyon. Possibly cists; sherds.

Site 45.—Knoll, Wildcat Canyon, east side, ¼ mile below Nephi Canyon, chipped flints, sherds, and metate.

Site 46.—East side Wildcat Canyon, 300 yards below site 45. Sherds, worked flints, and muller fragment collected.

Site 47.—Wildcat Canyon, ¼ mile south of site 46. Sherds and flints on small hill.

Site 48.—On sand knoll at junction of Wildcat and Kitchen Canyons. Several coursed masonry houses grouped around large circular depressions, possibly kivas. Also slab cists. Metates well worked. Sherds of late types.

Site 49.—West side Kitchen Canyon, ¼ mile above site 48. Sherds and slab cists.

Site 50.—On small knoll opposite mouth of Kitchen Creek. Sherds, metate, and chipped flints.

Site 51.—300 yards north of site 50. Nine slab cists, sherds, and chipped flints on knoll, 30 feet high, west side of Kitchen wash.

Site 52.—On knoll 200 yards north of site 51. A cist, sherds, and chipped flints.

Site 53.—West side of junction of Kitchen and Wildcat Canyons, on knoll 50 feet high. Four rectangular masonry rooms form a semicircle around the north side of a circular depression, probably kiva. Also two slab cists, sherds, metates, and mullers, of late types.

Site 54.—200 yards north of site 53. A slab cist and late type sherds. Probably is part of site 53.

Site 55.—¼ mile north of site 54. Late types of sherds on knoll.

Site 56.—300 yards above site 55. Small slab cist and plain sherds.

Site 57.—¼ mile north of site 56. Sherds and chipped flints.

Site 58.—½ mile north of site 56. Small cist, sherds, and metate fragment.

Site 59.—East side Kitchen Canyon, 300 yards above Gidd's corral. Sherds, flints, and small slab cist.

Site 60.—On knoll ¼ mile south of Gidd's corral. Coursed masonry, rectangular house and slab cists or houses. Sherds and flints.

Site 61.—¼ mile south of site 60. Slab cist and sherds.

Site 62.—Small knoll south of Elmo's Spring. Sherds, flints, and metate.

Site 63.—1 mile south of site 62. Plain sherds and flints scattered on knoll.

Site 64.—¼ mile west of Jenny's Clay Hole. Flint workshop and plain sherds.

Site 65.—¼ mile south of site 64, east bank of Finn Little Canyon. Knoll with thousands of sherds, flints, and metates. No evidence of houses.

Site 66.—½ mile northeast of Jenny's Clay Hole. Flint-chipping station.

Sites 67–70.—Located on large flat 2½ miles east of Jenny's Clay Hole. Sherds and flint-chipping sites cover the flat.

Site 71.—¾ mile northeast of Jenny's Clay Hole. Knoll about 30 feet high with four slab cists and sherds (pl. 45, *f*).

Site 72.—1¼ miles west of Jenny's Clay Hole facing Finn Little Canyon. Rectangular houses with coursed stone walls, grouped in semicircle on north side of circular depression.

Site 73.—¼ mile southwest of site 72. Coursed stone-wall houses and slab cists. Late pottery types.

Site 74.—¼ mile east of site 73. Two coursed stone houses.

Site 75.—¼ mile southeast of site 74. Two rectangular coursed stone houses and slab cist.

Site 76.—300 yards southeast of site 75, or ½ mile from Finn Little Canyon. Five rectangular coursed stone houses grouped around semicircle. Late pottery types.

Site 77.—1½ miles southwest of site 76. Slab cists. Sherds: Plain, black-on-white. No corrugated sherds.

Site 78.—½ mile east of site 76. Five coursed rectangular stone houses grouped around circular depression. Late pottery types.

Site 79.—⅓ mile southeast of site 76. Scattered sherds and worked flints.

Site 80.—¼ mile west of Finn Little Canyon. Three rectangular coursed stone houses around circular depression. Late pottery types.

Site 81.—300 yards north of site 80. Three rectangular coursed stone houses in semicircle on north side of circular depression. Also stone slab cist.

Site 82.—East side Clark Canyon. Five rectangular coursed stone houses and slab cist.

Site 83.—¼ mile southwest of site 82. Rectangular coursed stone houses and slab cist (pl. 45, *b*).

Site 84.—200 yards east of site 83. Rectangular coursed stone house and cists.

Site 85.—½ mile northeast of site 84. Four rectangular coursed stone houses in semicircle on north side of circular depression.

Site 86.—½ mile northwest of site 85. Five slab structures on knoll top.

Site 87.—1 mile west of site 86. Large rectangular slab structure on knoll top. Sherds: Plain, black-on-white.

Site 88.—300 yards southwest of site 87. Scattered sherds and flints.

Site 89.—¼ mile west of site 88. Small slab cist, sherds, and flints.

Site 90.—At mouth of Neaf Springs Canyon. Two slab cists and plain sherds.

Site 91.—Cave opposite Neaf Springs previously dug. Sherds, muller, and corncob found.

Site 92.—Head of Neaf Springs Canyon. Scattered plain and black-on-white sherds, metate, and muller fragments.

Site 93.—¼ mile southeast of Neaf Springs on south side of canyon. Scattered sherds and flint chips. Sherds and other evidence of occupation were scattered in the general vicinity of Neaf Springs.

Site 94.—On point above head of Seaman Canyon. Four rectangular coursed stone houses. Late pottery types.

Site 95.—Head of Seaman Canyon. Rectangular coursed stone house. Late pottery types; flints.

Site 96.—200 yards northeast of site 95. Rectangular structure of slabs, outside of which was a coursed stone wall (pl. 45, *e*).

Site 97.—150 yards northwest of site 96. A structure like that at site 96.

Site 98.—½ mile northeast of site 97. Large rectangular stone house on knoll.

Site 99.—¼ mile northwest of site 98. Scattered sherds, flints, metate, and muller.

Site 100.—½ mile north of site 98. One small slab cist, plain sherds, and flints.

Site 101.—½ mile east of Johnson Lakes Canyon. Two slab cists, sherds, and flints.

Site 102.—On small knoll 1½ miles east of Johnson Lakes Canyon, 4½ miles north of Flood Canyon. Slab cist, sherds, and flints.

Site 103.—North edge of Flood Canyon, ¼ mile south of site 102. Slab cist, sherds, and flints.

Sites 104–107.—On north rim of Flood Canyon. Scattered sherds and flints and probably several house ruins.

Site 108.—¼ mile north of site 107. Two slab cists. Sherds: Plain and black-on-white. Worked flints.

Site 109.—On knoll west of upper end of Flood Canyon. Three slab cists, sherds, flints, and metate.

Site 110.—⅓ mile northwest of site 109. Traces of ruins on large flat knoll. Late pottery types.

Site 111.—1 mile up Long Canyon. Cave containing two masonry wall houses and pictographs in blue-green, purple, and red. Also sherds and flints.

Site 112.—On flat between Finn Little Canyon and Clark Canyon. Scattered plain and black-on-white sherds and flints.

Site 113.—At junction of Long and Johnson Canyons. Three circular slab and adobe houses 8 feet in diameter each. Previously excavated. Sherds.

Site 114.—Knoll with two masonry rooms and cave, 200 yards above junction of Flood and Johnson Canyons. Sherds.

Site 115.—In Dairy Canyon, north side on sandy knoll 50 feet high, ½ mile west of Alvin Judd's ranch. Traces of coursed stone walls and slab cist containing burial. Flints and sherds scattered about.

Site 116.—At Alvin Judd's ranch, Johnson Canyon. Rectangular masonry houses, cists and slab-lined kiva (?). The kiva was partly excavated.

Site 117.—Petroglyphs of zoomorphic and anthropomorphic figures on wall in James Bunting's corral on east side of Johnson Canyon ¼ mile north of Long Canyon (pls. 46, 47).

Site 118.—Knoll ⅓ mile south of Neaf Hamblin's ranch. Slab cists.

Site 119.—⅓ mile east of Neaf Hamblin's ranch. Several coursed stone houses and slab cists. Traces of two flexed burials. Sherds, flints, and metate fragments.

Site 120.—North side Dairy Canyon, sandy knoll 1,000 feet west of site 115. Slab cist, sherds, and flints.

Site 121.—50 yards north of site 120. Dumbbell-shaped petroglyphs on ledge.

Site 122.—Sandy knoll north side of Dairy Canyon, 1,000 feet west of site 121. Ruins of coursed stone masonry houses and refuse heap. Late pottery types, flints, and muller fragments.

Site 123.—Dairy Canyon, 1½ miles from Judd ranch at junction of north branch and main canyon. Coursed stone houses on sandy knoll. One bowl and two corrugated pitchers found.

Site 124.—Dairy Canyon ¼ mile southwest of site 123, north side of main canyon. Slab cist, black-on-white sherds, and flints.

Site 125.—Junction of upper forks of Dairy Canyon. Scattered sherds.

Site 126.—South side Dairy Canyon 2 miles west of Judd ranch. Sherds, slab cist, and muller.

Site 127.—South side Dairy Canyon 1 mile west of Judd ranch. Muller fragments.

Site 128.—On bluff north side of mouth of Joel's Canyon. Petroglyphs on ledge.

Site 129.—North side mouth of Joel's Canyon, bluff overlooking Johnson's Canyon. Traces of stone and adobe walls and sherds.

Site 130.—North side of mouth of Oak Creek. Zoomorphic, anthropomorphic, and geometric petroglyphs on wall (pl. 48).

Site 131.—Rock shelter just above site 130. Remnants of masonry walls and disturbed burials. Sherds: Plain, corrugated, black-on-white. Geometric petroglyphs.

Site 132.—North side Oak Canyon ½ mile from site 131. Cave with masonry walls and geometric petroglyphs inside.

Site 133.—South side mouth Oak Canyon. Geometric petroglyphs on ledge.

Site 134.—¼ mile south of site 133. Sandy knoll inside canyon with scattered sherds.

Site 135.—Sandy knoll south side junction of Oak and Johnson Canyons. Scattered sherds.

Site 136.—Sandy knoll north side of junction of Oak and Johnson Canyons. Scattered sherds.

Site 137.—On knoll ¾ mile east of Johnson Canyon opposite mouth of Dairy Canyon, north side of Joel's Canyon. Masonry-wall traces and slab cists.

Site 138.—Hillside north of Joel's Canyon. Remnants of three coursed masonry houses.

Site 139.—Rock shelter east side Johnson Canyon north of mouth of Joel's Canyon. Sherds and debris.

Site 140.—On flats between head of Clark Canyon and Finn Little Canyon. Slab cist and plain sherds.

Site 141.—½ mile northwest of site 112 on flats. Scattered sherds and flints.

Site 142.—Cave with traces of masonry walls. Near mouth of Dairy Canyon, north side. Sherds.

Summary.—Sites were found throughout the entire region explored, but increased in number toward Johnson Canyon, that is, in the better water localities. Evidence of several periods is clear. These periods are roughly comparable to the Basket Maker II, III, and Pueblo I and II periods of the San Juan drainage. Basket Maker II sites, however, are extremely rare. Sherds of unbaked clay found in site 2 may indicate Basket Maker II. Absence of pottery at slab houses is certainly no proof of Basket Maker II, for several masonry houses also had no associated ceramics. Sites with a basically Basket Maker III (Modified Basket Maker) culture are fairly common, especially in the western part of the region explored. Remains of this culture comprise slab cists and larger slab structures which have been interpreted as houses. The associated pottery is usually a plain ware, Paria Gray, and a Basket Maker style of primitive black-on-gray, though later styles also occur at a few slab sites.

Early Pueblo or transitional sites have structures with crudely coursed stone walls erected over slab foundations. The pottery wares resemble those of the preceding period.

The late period has a culture roughly like that of the San Juan Pueblo II period, having rectangular coursed masonry structures and corrugated and black-on-white pottery. Late sites are more numerous than those of the other periods, most of the sites in Kitchen, Wildcat, Finn Little, Johnson Lakes, and Johnson Canyons being of this type. The typical site has several rectangular rooms (probably houses) of coursed masonry forming a semicircle around the northern side of a circular depression which probably contains a kiva. Pottery types are Johnson corrugated, Tusayan black-on-white, Tusayan black-on-red, Tusayan red, Johnson gray-tan, and a small amount of Tusayan polychrome.

Late sites are generally on sandy knolls or other low eminences. Habitable caves frequently contain traces of late type masonry walls. Basket Maker and early Pueblo or transitional sites are often near the late sites or are on canyon rims.

Petroglyphs and pictographs are fairly numerous in the region and apparently date from all periods. They have stylistic features peculiar to the region.

Depredations have left few sites of interest unharmed. Caves especially have been dug. Many sites, however, would repay careful excavation, particularly the late-period masonry rooms with associated depressions, which have been little molested.

VILLAGES AND ARCHITECTURE

SLAB STRUCTURES

Slab structures occur alone at some sites but at others belong to villages of rectangular masonry houses. As the pottery associated with the former is a black-on-gray and Paria gray, both distinctly Basket Maker wares, most of these slab-structure sites clearly belong to a culture which in ceramics and architecture closely resembles the Basket Maker III of the San Juan. A survival of the use of such structures into later times, however, is demonstrated by such sites as 41 and 42, where later wares, including corrugated pottery, are found.

These sites are revealed by the tops of vertically set stone slabs projecting above the ground surface. Although no excavation was undertaken, the stones outline structures which, judging from a few that are partially eroded, were probably dug 2 or 3 feet deep. Small, circular cists associated with these were probably storage bins or fire pits of some kind. Larger cists, ranging up to 7 and 8 feet in diameter, may, however, well have been houses, for the grouping of half a dozen or more such structures in compact clusters must indicate small communities. Similar structures in the Zion Park region which are slab-lined, side and bottom, seem to have been small domiciles (Wetherill, 1934). The limited number and extremely small size of these houses, however, shows that such communities were probably family groups or lineages

Most of these sites are in canyon bottoms, on sandy knolls which rise 10 to 30 feet above the nearby wash. Such locations are near arable and well-drained land, but are by no means protected.

The important data on the slab-structure sites are tabulated below. Field sketches of sites 39, 41, 42, 86, and 87 are reproduced in figures 27 to 31.

TABLE 1.—*Slab structures*

Site	Structure	Diameter	Shape	Structure	Diameter	Shape	Remarks
26	A	7 ft	Circular				
39	A	5 ft. 6 in.×8 ft. 6 in.	Oval	F	3 ft	Circular	Village (?). Sherds and traces of other cists nearby. C has stone floor, 8 inches deep.
	B	6 ft.×8 ft	do	G	3 ft	do	
	C	6 ft.×8 ft. 9 in.	do	H	2 ft. 6 in	do	
	D	6 ft. 6 in	Circular	I	3 ft. 6 in	do	
	E	7 ft. 2 in	do				
41	A	5 ft. 6 in	do	H	3 ft	do	A, D, C, E, F contain charcoal. Traces of other cists.
	B	6 ft	do	I	3 ft	do	
	C	7 ft.×10 ft	Rectangular	J	3½ ft	do	
	D	6 ft. 3 in	Circular	K	3 ft	do	
	E	7 ft.×9 in	Oval	L	3 ft	do	
	F	5 ft. 6 in.×8 ft.	do	M	3 ft	do	
	G	6 ft	Circular				
42	A	5 ft.×7 ft	Oval	F	6 ft.×8½ ft	Oval	Traces of several other cists.
	B	4½ ft	Circular	G	3 ft	Circular	
	C	5½ ft	do	H	3 ft	do	
	D	6 ft	do	I	2½ ft	do	
	E	5 ft.×8 ft	Rectangular	J	2½ ft	do	
49	A	7 ft. 6 in	Circular				Probably belongs with village, site 48, ¼ mile away.
51	A	7½ ft	do	D	7 ft	do	
	B	2½ ft	do	E	3½ ft	do	
	C	3½ ft	do				
52		7 ft	do				
56		3 ft	do				
59		4½ ft	do				
71	A	7 ft	do	C	4½ ft	do	Basket Maker pottery (pl. 45, *f*).
	B	5 ft	do	D	2 ft		
77	A	4 ft	do	C	6½ ft	do	Basket Maker pottery.
	B	5 ft	do	D	6 ft. (?)	do	
86	A	5½ ft	do	D	7 ft×8 ft	Rectangular	Do.
	B	6 ft	do	E	2 ft. 3 in	Circular	
	C	8½ ft	do				
87	A	6½ ft.×21 ft	Rectangular	B	7 ft	do	A apparently subdivided. Basket Maker pottery.
89		3 ft	Circular				Near site 87.
90	A	4 ft	do	B	4 ft	do	Plain sherds only.
100		3 ft	do				
108	A	2½ ft	do	B	5 ft	do	
109	A	2 ft	do	C	2 ft	do	¼ mile from last.
	B	5 ft	do				
140		3½ ft					

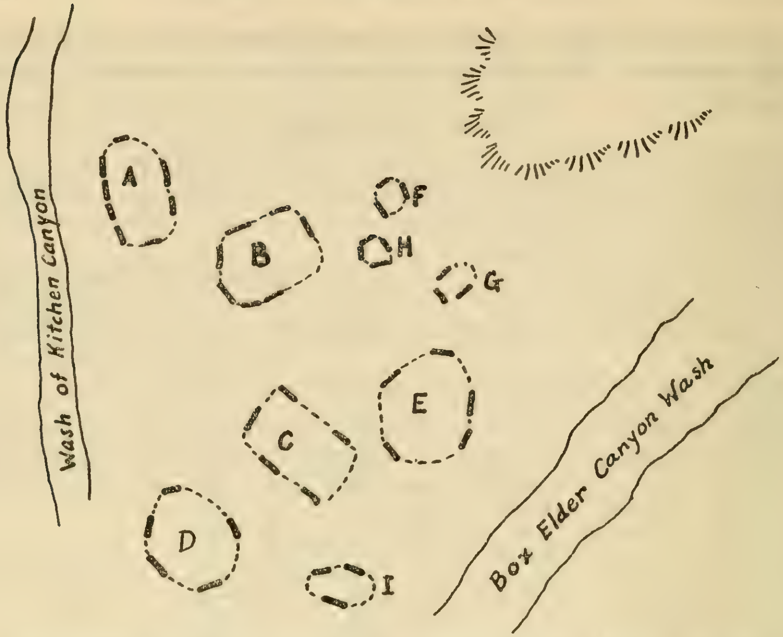

Wash of Kitchen Canyon
A
B
C
D
E
F
H
G
I
Box Elder Canyon Wash

FIGURE 27.—Sketch map of slab structures, site 39, Kitchen Canyon.

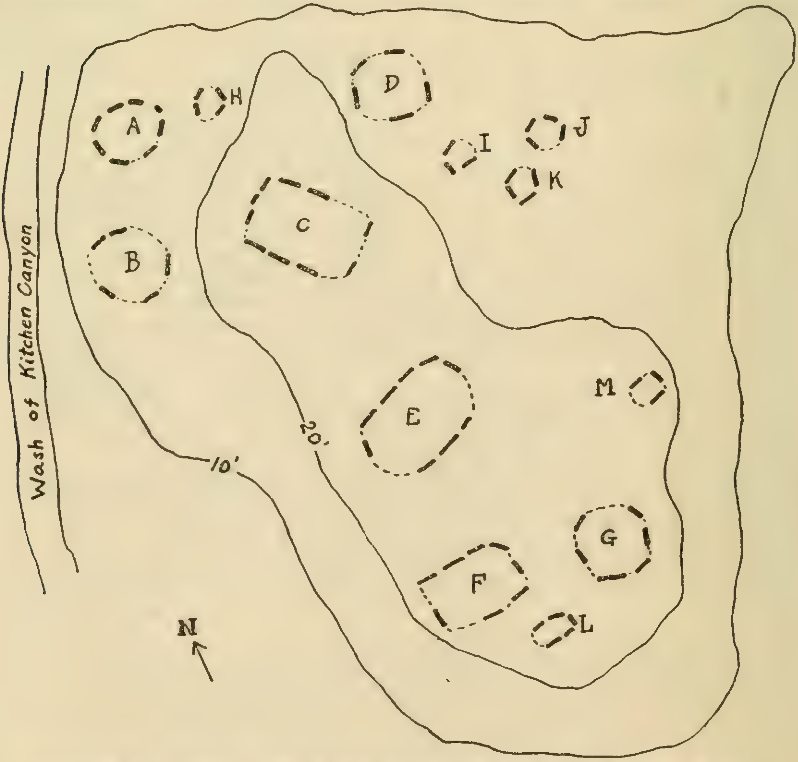

Wash of Kitchen Canyon
A
H
D
I
J
K
C
B
M
E
20'
10'
G
F
L
N

FIGURE 28.—Sketch map of slab structures, site 41, Kitchen Canyon.

ADOBE WALL PIT LODGES

Site 2, a cave (fig. 32, pls. 43, 44), contains three circular pit lodges. A (pls. 43, *a*; 44, *a*) is 10 feet 8 inches. B (pl. 43, *b*) is 9 feet 6 inches, and C, 8 feet 6 inches in diameter. All are nearly identical in construction. A was excavated: Pit, 3 feet deep, circular, paved with sandsone flagstones; pit edge lined with 12 to 14 vertical slabs each 1 inch to 4 inches thick, 2 feet wide, 3 feet tall; floor and wall plastered with red adobe. Wall, averaging 8½ inches wide, carried above

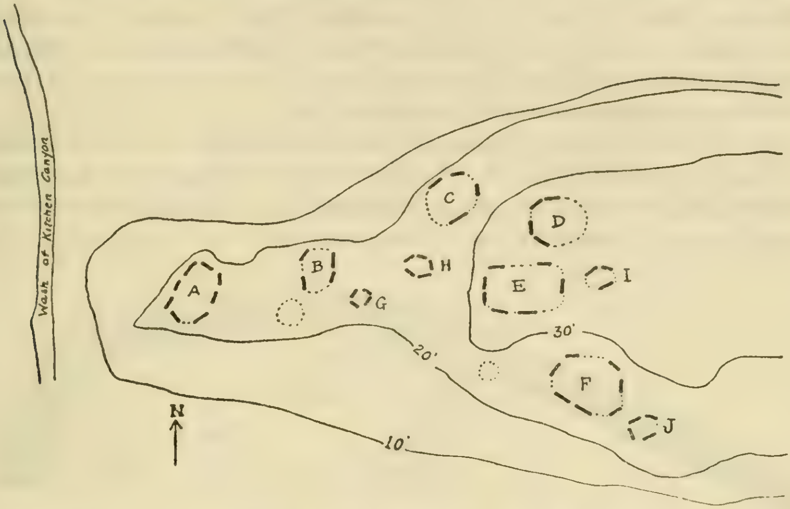


Figure 29.—Sketch map of slab structures, site 42, Kitchen Canyon.

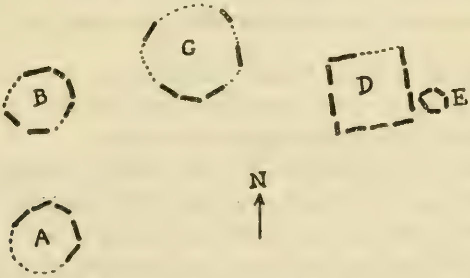


Figure 30.—Sketch map of slab structures, site 86, near Clark Canyon.

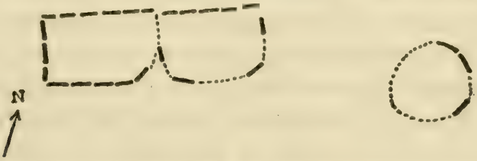


Figure 31.—Sketch map of slab structures, site 87, near Clark Canyon.

pit, consists of a few horizontal stones laid in much adobe; layers or courses are 4 inches to 6 inches thick, each rounded on top; adobe in wall is reinforced with chopped grass and sticks or long fibers running horizontally; highest point now standing is 7 feet 3 inches above floor. Door: Southeastern side, bottom being about ground level; sides are rounded ends of wall; width, 3 feet 7 inches, slab under door stands 2 feet 1½ inches above floor. No fireplace, but fire had been in middle of floor. Unburned adobe lumps with pole impressions suggest horizontal pole-and-adobe roof.

An adjoining circular house, C, 8 feet 6 inches outside diameter, was built probably before A. Floor, 1 foot 11 inches below floor of A. Wall is similar to A, having a slab-lined base and small number of stones in much adobe above. Door, east side, was 2 feet wide, with horizontal slab sill 4 feet 6 inches above floor, or 1 foot 6 inches above slabs. Walls of C, which was not completely excavated, did not show above cave floor previous to excavation.

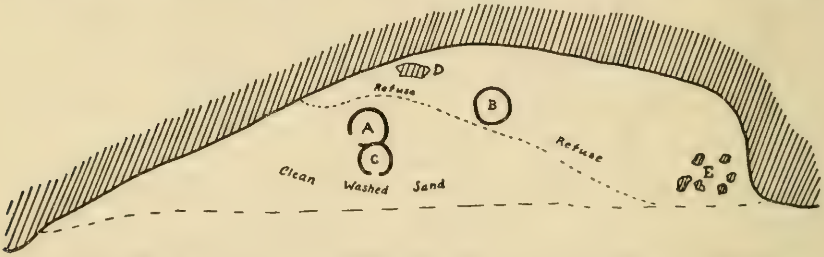


Figure 32.—Sketch map of cave, site 2, Molly's Nipple Canyon.

A, *B*, *C*, Circular houses; *D*, rock with rubbed depressions; *E*, sandstone blacks, roughly outlining a circle.

These houses are probably of the period of the late Paria gray and Basket Maker black-on-gray pottery, although few sherds to date them were found. A Tusayan black-on-red pitcher (fig. 41) within 1 foot of the floor of house A, together with the beginnings of masonry in the upper walls suggests influence from Tusayan, Pueblo II, not yet fully implanted locally; in short, a transition to the local masonry house period. It is by no means impossible, however, that some of the slab structures at the out-of-door sites described above had walls like these, for such walls are very perishable. Wetherill (1934) found some slab structures which had slab-lined floors and possibly crude masonry walls, in the Zion National Park region. Were the site 2 houses subject to erosion, only a ring of slabs would remain.

RECTANGULAR MASONRY HOUSES

In the latest building style masonry was used in rectangular, 1-room houses. Foundations of walls show that rectangular sandstone blocks were carefully selected and laid in even courses. As a rule each room stands alone, although but a few feet from its neighbor. Only rarely were two or more rooms joined end to end, a practice which, if consistently followed, would have saved the builders an appreciable amount of labor. Transitional sites or perpetuation of slab lining in late houses was seen at sites 96 and 97 (pl. 45, *e*) where vertically set slabs lined the inside of rectangular masonry wall rooms. No doubt excavation would have revealed this at other sites.

The transition from slab to masonry houses was not abrupt. Several slab-house sites have corrugated and other late pottery types, showing that the full force of the Pueblo II influence emanating from the Kayenta district was not effective at once. Masonry followed but did not immediately replace slab structures, e. g., site 60, figure 34. In fact, slab cists and possibly occasional slab houses belong also to the latest, most fully developed masonry-house settlements. In one instance, site 115, a cist accompanying a masonry house contained a burial.

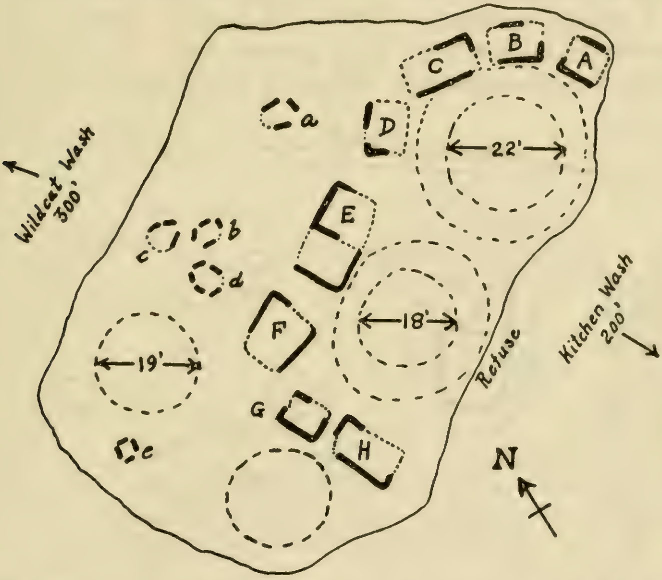


FIGURE 33.—Sketch map of masonry houses, depressions, and slab structures, site 48, Wildcat Canyon.

There is nothing to indictae that, as in parts of the San Juan and in the Flagstaff region, these earliest masonry structures were primarily granaries. On the contrary, that they exceed the slab structures in size points to their use as dwellings. If, as in the Flagstaff region (Hargrave, 1930), the depression held a subterranean house, to which the masonry rooms were accessory granaries, one must assume a tremendous excess of storage space. It is impossible to believe with Wetherill (1934) that the absence of fireplaces in such rooms in the Zion Park region proves them to have been granaries for the adjoining subterranean house. Clearly, the aggregate of rooms with accompanying sites and kiva excavated by Smith in the Zion Park region (Smith, 1934) represents a village unit of the Johnson Canyon type, the living quarters being full-fledged Pueblo II style masonry houses.

The typical masonry-house village consists of three to half a dozen separate rooms grouped so as to form a semicircle around the northern side of a circular depression, which undoubtedly contains a kiva (figs. 33, 35, 36). Each of these conventional house groups must have held a definite social unit, which, judging by its size, could not have exceeded a family or lineage of 20 or 30 people. Because the size of these settlements was very little greater than that of the Basket Maker slab-house settlements, the social development concurrent with the introduction of masonry is merely implied in a more definite planning of the village. There was, however, a denser population for there are more masonry than slab villages. Larger communities of the late San Juan Pueblo II and III types, though no doubt ecologically possible, did not occur. Many of these independent aggregates were so close together—a few hundred yards apart—that to have concentrated in larger communities would have entailed no practical difficulties. The only amalgamation of two or more settlements is at site 48 (fig. 33), where nine rooms were arranged around two depressions.

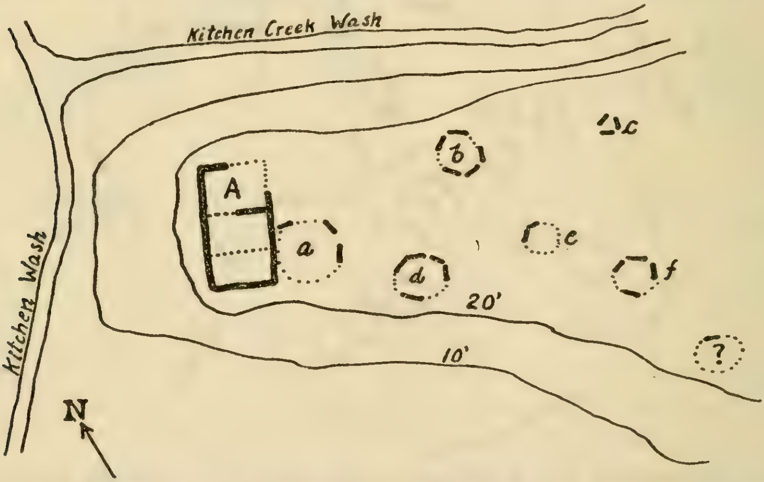
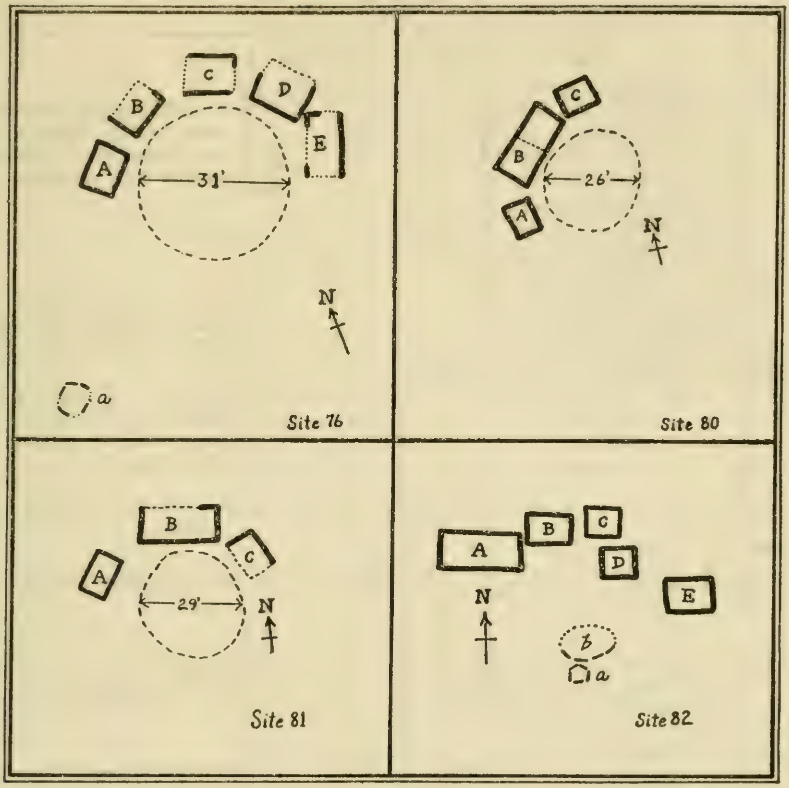


Figure 34.—Sketch map of masonry house and slab structures, site 60, Kitchen Canyon.

The following table summarizes the more important data concerning these sites. Capital letters represent rectangular masonry houses; small letters, slab structures. Measurements are in feet.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31'
N
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Site 76
C
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26'
A
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Site 80
B
C
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29'
N
Site 81
B
C
A
D
E
N
b
a
Site 82

FIGURE 35.—Sketch maps of masonry houses, depressions, and slab cists, sites 76, 80, 81, and 82, Finn Little and Clark Canyons.

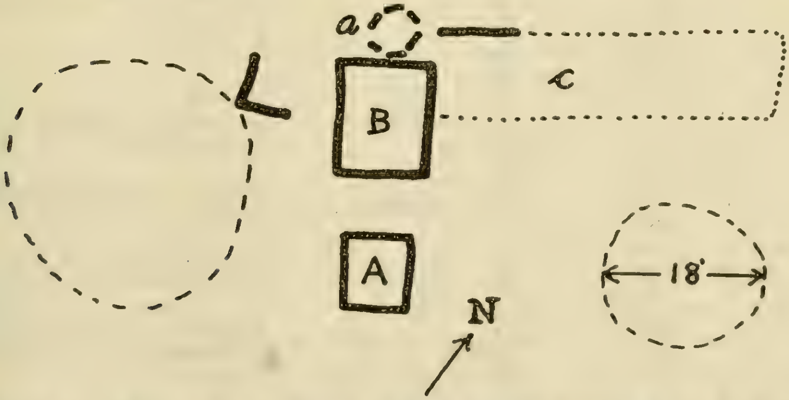


FIGURE 36.—Sketch map of masonry houses, depressions, and slab cist, site 119, Johnson Lakes Canyon.

TABLE 2.—*Data on house sites*

Site	Rectangular masonry houses	House dimensions	Diameter depression	Slab structures	Diameter	Remarks
		Feet	*Feet*		*Feet*	
25		8×15				
48	A	8×7	22	a	3½	On knoll about 60 feet high between junction Wildcat Canyon and Kitchen wash. Other cists and flint workshop nearby.
	B	8×8		b	2	
	C	8×12		c	3	
	D	7×7		d	3	
				e	2½	
	E	9×18	18 (?)			Fig. 33.
	F	8×10				
	G	6×6				
	H	7×10				
53	A	8½×12	23	a	6	On knoll about 55 feet high, west of Wildcat wash. Site 54, a cist, probably is part of this.
	B	8×12		b	5	
	C	8×9		c	3	
	D	8×12				
60	A	12×27	None	a	9	On knoll. Slab house *a* seems under A, probably earlier? Masonry house was probably subdivided (fig. 34).
				b	5½×6½	
				c	4	
				d	8	
				e	3½	
				f	6	
61				a	3½	¼ mile from site 60; may belong with it.
72	A	8×9	36	None		Room C probably subdivided.
	B	7½×10				
	C	8×21				
	D	8×8				
				a	6	
				b	2½	
73	A	7½×9	None	c	4	On knoll ¼ mile southwest of site 72. No definite arrangement.
	B	8×8		d	8	
	C	9×10		e	7	
				f	5	
74	A	8×12	None	None		On knoll ¼ mile east of site 72.
	B	8½×14				
75	A	8×10	None	(?)	3½	On knoll ¼ mile southeast of site 74.
	B	9×17				
76	A	7×9	31	None		300 yards southeast of site 75; ½ mile from Finn Little Canyon wash (fig. 35).
	B	7×8				
	C	8×9				
	D	9×11				
	E	7×13				
78	A	8×10(?)	33	None		On knoll. Arrangement like site 76 (fig. 35). Refuse to south.
	B	8×12				
	C	8×10				
	D	9×14				
	E	7×11(?)				
80	A	7×8	26	None		Room B is probably subdivided (fig. 35).
	B	8½×19				
	C	8×8				
81	A	7½×9	29	a	6	300 yards from site 80. Room B probably subdivided (fig. 35).
	B	8×21				
	C	8×9				
82	A	12×26	None	a	4	On knoll. Lacks usual semicircular arrangement and depression (fig. 35).
	B	9×12		b	7½	
	C	8×8				
	D	8×8				
	E	8×9				
83	A	8×10	None	Pl. 45, *b*		¼ mile from site 82.
	B	6½×9½				

TABLE 2.—*Data on house sites*—Continued

Site	Rectangular masonry houses	House dimensions	Diameter depression	Slab structures	Diameter	Remarks
		Feet	*Feet*		*Feet*	
84	A	8×8	None	a		200 yards east of site 83.
	B	8×10(?)		b	5	
85	A	8×8(?)	22	None		
	B	7×8				
	C	7½×13				
	D	8×8				
94	A	10×12	None	None		Lacks semicircular arrangement and depression. Closely grouped. Room long axes east-west.
	B	8×9				
	C	(?)				
	D	9×10				
95	A	8×26	None	None		Room A probably subdivided. Probably 2 other rooms in arrangement like site 94.
	B	(?)				
	C	(?)				
96	A	4×5	None	None		200 yards from site 95. Has vertical slab lining base of inside of wall.
97	A	3×4	None	None		150 yards from site 96. Construction like site 96.
98	A	8×22	None			1 house only.
102	--	(?)	None		2½	
114	A	8	None	None		A is circular. Only plain and black-on-white pottery.
	B	9×10				
116	A	4×4	16	a		Not typical arrangement. Depression held circular slab room.
	B	6¼×13		b		
	C	6×8(?)		c		
	D	6×8(?)		d		
	E	6×8(?)				
119	A	7½×8	18	a	4	C probably subdivided into several rooms (fig. 36).
	B	10×12				
	C	7×42				
137	A	5×8	(?)	a	4	Rooms A and B, joined end to end. Lacks semicircular arrangements.
	B	7×8		b	5	
	C	8(?)×16				
	D	(?)				
138	A	(?)				
	B	(?)				
	C	(?)				

It is probable that the depression of each house cluster contains a kiva. Site 116 had such a depression on the southern side of a random group of at least 5 rectangular masonry houses, 4 small slab cists and one small slab house (?). A small amount of excavation to ascertain whether a structure were present in the depression revealed a circular room, approximately 16 feet in diameter, with a clay floor 3 feet deep on the uphill side, 1 foot 10 inches deep on the downhill, the pit edge lined with vertical slabs. Excavation was not carried far enough to reveal interior features. The depression accompanying Smith's masonry village at Shonesburg in the Zion Park region had a subterranean structure, possessing, however, most of the conventional features of a kiva (Smith, 1934): Slab-edged bench, ventilator, deflector, and central firepit. Following is a summary of the ratio of rooms to each depression (kiva ?).

Number of rooms to kiva (?) in masonry groups:

Site 48	4:1
Site 53	4:1
Site 72	4:1
Site 76	5:1
Site 78	5:1
Site 80	3:1 (or 4:1)
Site 81	3:1 (or 4:1)
Site 85	4:1
Site 116	5:1
Site 119	3:1
Site 137	4:1

Apparently the diffusion of Pueblo culture which first introduced late ceramic types, then masonry houses, also brought the tendency to community standardization, but before large, composite villages developed the cultures disappeared.

The locations of these sites are similar to those of the slab structure sites. Knolls in canyon bottoms were preferred, but some are above the cliffs overlooking the canyons. There is a marked concentration of these toward the west, especially in Johnson Canyon, where greater water supply and fertile canyon bottom alluvium must have enticed an agricultural people.

MASONRY CLIFF HOUSES

It is but natural that suitable caves should have been used for houses or granaries by the occupants of the masonry villages. The important data concerning these are summarized below.

Site 4.—Several small caves, partially walled with horizontal masonry; also retaining walls for floor. Late period.

Site 11.—Somewhat similar to site 4.

Site 18.—Suggestion of former masonry walls in a cave; also late pottery types (pl. 45, *a*).

Site 20.—A small cave; contained traces of a wall of stone and adobe reinforced with sticks; also late pottery types.

Site 27.—Traces of masonry in dwelling caves, and semicircular masonry granary, 7 feet diameter, in ledge.

Site 31.—A granary somewhat similar to last.

Site 37.—Rock shelters and caves (pl. 45, *d*); one wall to fill cave entrance, of alternating adobe and courses of stones, each 2 inches thick, 6 inches to 14 inches long, 7 inches wide; window, 18 inches high, 13 inches wide, with stone sill and log lintel; accompanied by small granaries of walled-up crevices, the walls usually having windows; also traces of a circular house, 8 feet 6 inches diameter of similar construction. This type probably preceded true masonry houses.

Site 111.—Cave with two masonry granaries, each about 6 feet in diameter, 4 feet high, built against cliff.

Site 129.—Traces of masonry and cists in cliffs.

Site 131.—Traces of masonry in cave.

Site 132.—Small cave with mouth once closed by 12-foot wall; other traces of masonry.

Site 8.—A cave; one room crudely indicated by roughly piled rocks. No pottery.

POTTERY

The pottery of the Johnson Canyon and Paria River region has few distinctive features or novel types. The majority of the wares are so similar to well-known wares that it would but add confusion to the already formidable list of Southwestern pottery types and obscure historical connections to coin new terms merely to distinguish minor local variations. For example, that tempering is almost invariably sand in this region that contains little but sandstone is not surprising and does not seem sufficient reason to distinguish by a new name a ware that is identical, except for temper, with a ware which is common elsewhere. New wares are named, therefore, only when there is no previously known ware to which they can be assigned, and when the number of sherds is sufficiently great and their characteristics sufficiently well defined to have significance. Scores of sherds were not readily assignable to any of the wares listed below. Perhaps some are variants of these wares, perhaps some are new types.

In the tabulation at the end of this paper, pottery has been entered as E, early; T, transitional; L, late. Early wares are Basket Maker black-on-gray and Paria gray. Transitional wares are probably Sevier black-on-gray and perhaps North Creek black-on-gray. Late wares are Tusayan black-on-white, Tusayan black-on-red, Tusayan red, Tusayan polychrome, Johnson gray-tan, and Johnson corrugated.

Unbaked clay vessels.—Site 2 yielded 10 sherds (11728 and 11716) of unbaked clay. These are about three-eighths of an inch thick, tempered with cedar bark; some bear impressions of coiled basketry on their exteriors. Vandals had despoiled this site, destroying any stratification and removing any other specimens. Similar sherds were found by Nusbaum (1922) in DuPont Cave, north of Kanab. Site 120 had a single unbaked, untempered rim sherd associated with a late, fired ware.

Basket Maker black-on-gray.—Paste firm; excessive sand and occasionally dark (igneous ?) temper which projects through both surfaces. Interior: Smoothed but not polished. Exterior: Rough, sometimes bearing fugitive red and frequently burned. Background: Brownish gray. Designs: Narrow lines, simple forms similar to San Juan and Little Colorado Basket Maker black-on-gray (fig. 37); Shapes: Bowls. Type site, 2, near Potter's Ranch. Occurrence: Mainly in slab structures, associated with Paria gray.

Sevier black-on-gray.—The absence of sufficient distinguishing minutiae to differentiate the ware of certain sites in this area from the black-on-gray of western Utah, described elsewhere (Steward, 1936, pp. 13–16), makes it inadvisable to coin a new term. This ware, apparently limited to bowls, has black on unslipped gray bowl interiors, the bowls having roughly smoothed or corrugated exteriors. It occurs here at transitional and late sites.

North Creek black-on-gray.—This ware, named and described by Spencer (1934, p. 74), has a very limited occurrence in this region. It is distinguished by a feldspar temper and a gray color and occurs at one or two sites that seem to be early.

Tusayan (Virgin) black-on-white.—The most common painted ware at late sites is clearly related to and no doubt derived from Tusayan black-on-white. Spencer's Virgin black-on-white (1934, p. 75) appears to be essentially the same ware. It has sand temper, fairly dense paste, a white slip, usually decoration with broad lines, and sometimes corrugated exteriors of bowls. Forms: Bowls with rims more frequently rounded or bevelled than square (fig. 42); a few ollas; only one ladle, which is of the bowl-and-handle type, from site 142. Designs: Broad lines, elements including straight lines, triangles, dots, dotted edges, and considerable diagonal hachure, like the black-on-red designs. (See figures 38 and 39.) Occasionally Basket Maker designs survive, even on corrugated bowls, site 41.

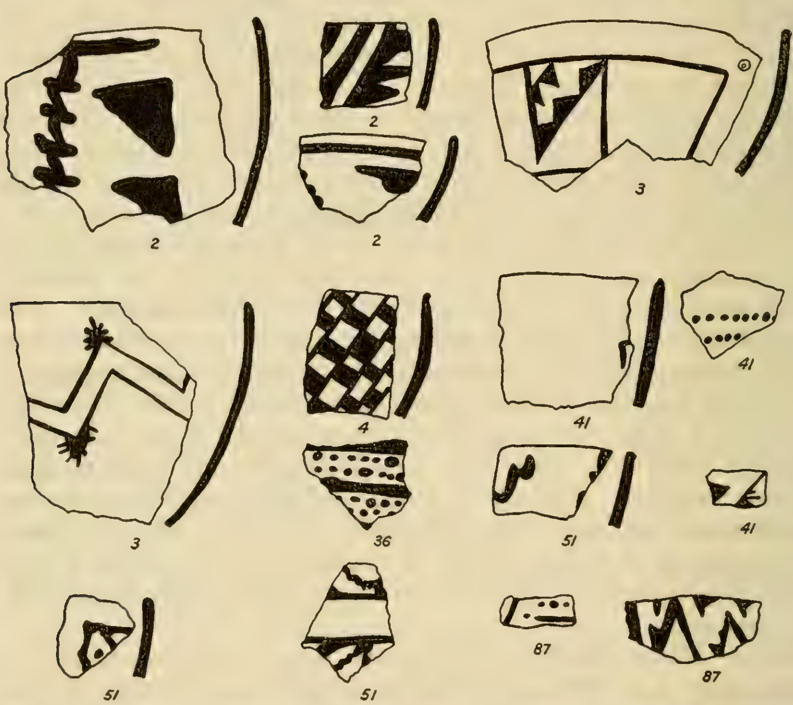


Figure 37.—Rim sherds and designs on Basket Maker black-on-gray. Numbers indicate sites in Johnson Canyon-Paria River region.

Tusayan black-on-red.—This ware does not vary sufficiently from that of Tusayan to warrant a new name. Paste: Gray to brick color. Temper: Relatively little, mostly quartz with occasional small amount of sherd. Exterior: Smoothed, rarely slipped and polished; sometimes has more or less fugitive red wash, probably applied before firing. Interior: Slip, which is more orange and less polished than Tusayan ware. Forms: Bowls, with rims like those of black-on-white (fig. 42); seed jars; ollas; pitchers. One pitcher (fig. 41), with designs more like black-on-white designs. Designs: Predominately parallel hachure in rectilinear figures (fig. 40), which are of a thinner, less permanent black than on Tusayan ware. Spencer's Middleton black-on-red seems to differ from this mainly in consistent lack of slip and absence of sand temper (Spencer, 1934). Occurrence: At practically all later sites, with Tusayan (Virgin) black-on-white, corrugated, etc., and masonry houses.

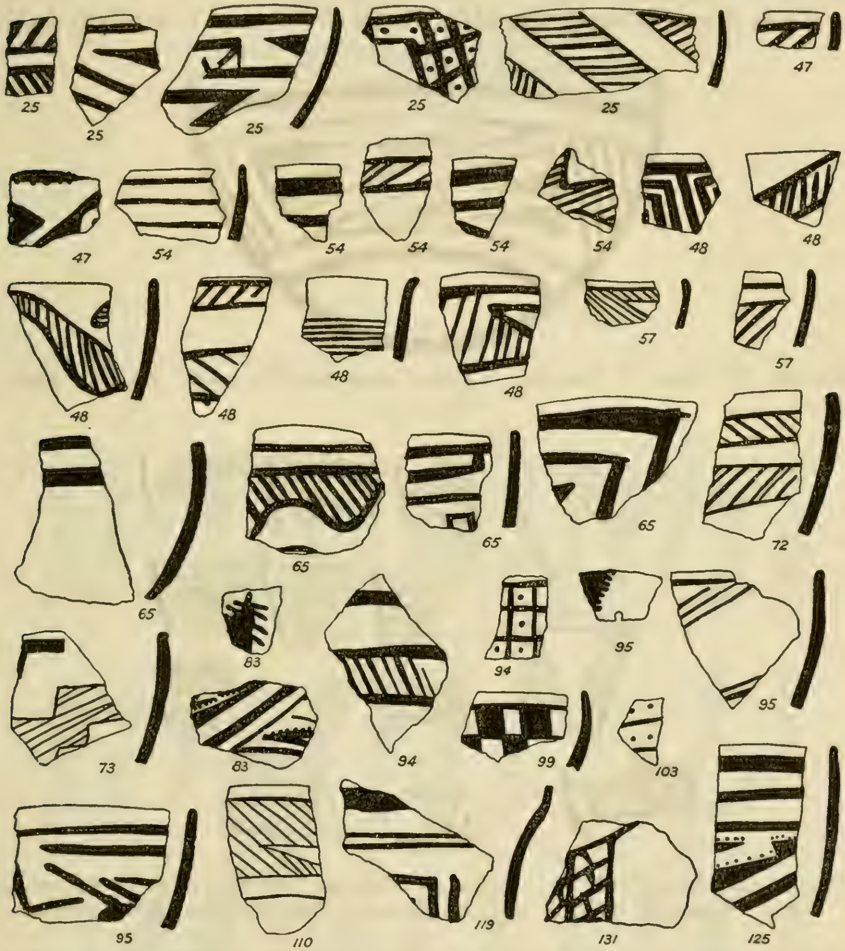


FIGURE 38.—Rim sherds and designs on Tusayan (Virgin) black-on-white bowls. Numbers indicate sites in Johnson Canyon-Paria River region.

Tusayan red.—A ware like last, lacking designs (possibly sherds are from undecorated portions of bowls).

Tusayan polychrome.—This was probably made locally or nearby as it usually has quartz rather than sherd temper, as in Arizona. Paste: Red to gray. Inferior to Arizona ware, the red in designs being thick and somewhat fugitive. Designs on bowl interiors; exteriors have somewhat fugitive red slip (fig. 40).

Paria gray.—Closely resembles Sevier desert and Great Salt Lake gray, to which it may be ancestral. Paste: Coarse, dark gray. Temper: Large quantities of quartz sand and some dark (igneous ?) particles. Thickness, averages five thirty-secondths of an inch to three sixteenths of an inch. Interior, poorly smoothed. Exterior: Smoothed, sometimes almost polished. (This polish and lack of designs, distinguish it from Basket Maker black-on-gray). Sometimes has fugitive red. Forms: Mostly flaring-mouth ollas with collars, like the Sevier and Great Salt Lake gray, which distinguishes

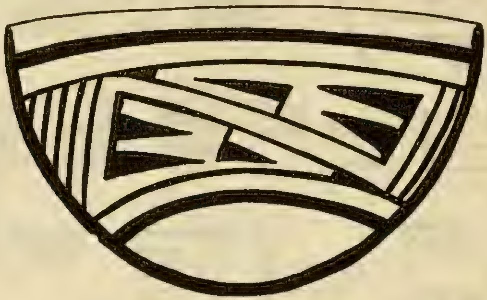


Figure 39.—Half of Tusayan (Virgin) black-on-white bowl, site 123, Dairy Canyon.

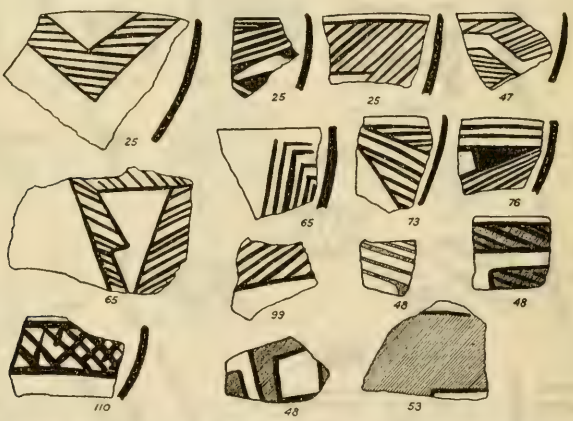


Figure 40.—Rim sherds and designs on Tusayan black-on-red and polychrome bowls. Numbers indicate sites in Johnson Canyon–Paria River region.

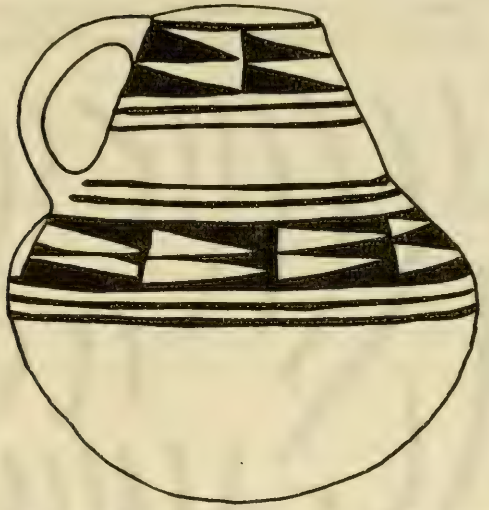
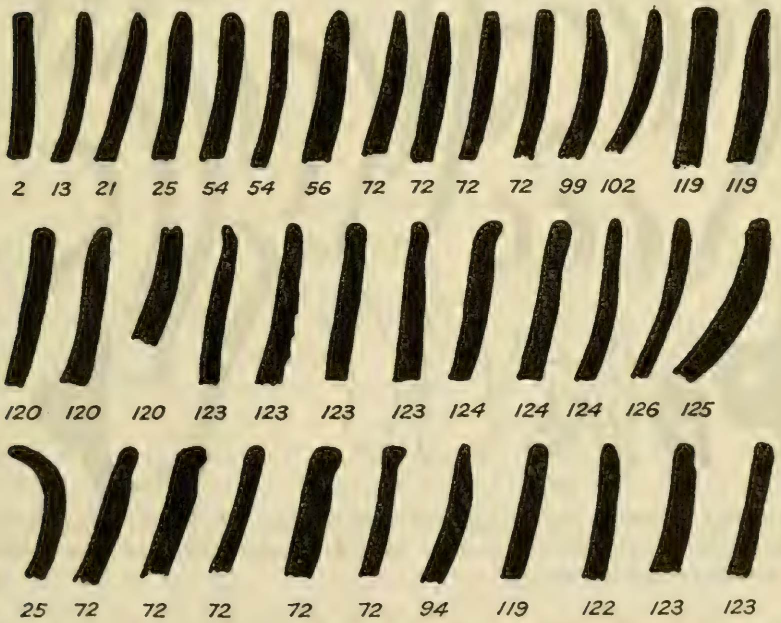


FIGURE 41.—Tusayan black-on-red pitcher, site 2, Molly's Nipple Canyon. Height, 5½ inches.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94
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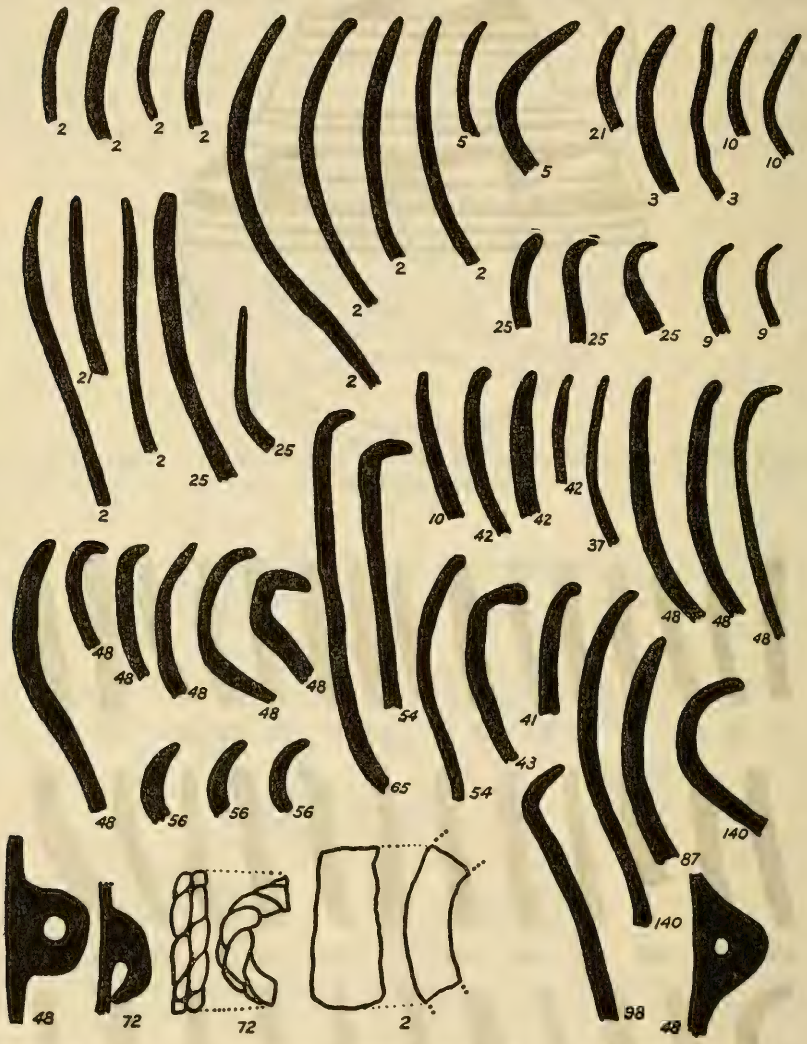
123

FIGURE 42.—Bowl rims. Upper two rows, Tusayan black-on-white. Bottom row, Tusayan black-on-red. Numbers indicate sites in Johnson Canyon-Paria River region.

the shapes from the later Johnson gray-tan (figs. 43, 44); two of these had mouths 7⅜ inches and 8½ inches in diameter; some deep bowls with thin lips (fig. 45). Occurrence: A Basket Maker and perhaps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48
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48
54
41
43
65
54
56
56
56
140
87
140
48
72
72
2
98
48

FIGURE 43.—Rim sherds and handles of plain ollas. Paria gray: Sites 2, 3, 5, 9, 10, 21, 37, and 87. Remainder are Johnson gray-tan. All from Johnson Canyon-Paria River region.

very early Pueblo ware, associated with Basket Maker black-on-gray, e. g., at sites 2, 3, 5, 51, 116. Type site: 2.

Johnson gray-tan.—An extremely variable ware, somewhat like Johnson corrugated but thicker, more variable in temper often including sherds, and greater in color range, varying from gray to tan.

Interiors are smoothed, lacking horizontal striations of corrugated ware and rarely showing more than fine scratches. Temper roughens both surfaces. Forms: Ollas, including wide and small-mouth (fig. 43), the latter being characteristic. There is considerable variation in these neck shapes (fig. 44), some approximating the Paria gray flaring-mouth olla forms. Some bear small vertical handles, which are either perforated lugs or a short strip with one end fixed, the other bent down (fig. 43). This belongs to the latest, masonry-house period.

Johnson corrugated.—Paste gray or brownish gray to tan. Temper: Large amount of quartz sand; occasional trace of sherds. Interior: Smoothed and striated. Exterior: Variable; plain coils; coils pinched and tooled, i. e., stick punched; alternating bands of pinched and plain; or partially obliterated. Occurs with Tusayan (Virgin) black-on-white at late masonry pueblo sites. Corrugated ware from Zion National Park region associated with similar black-on-white ware and masonry houses is identical with this. Forms: Wide-mouth ollas, with rims slightly curved over to outside; some have short handle attached vertically under rim and turned down (fig. 46); or made of three interwoven strips of clay, site 65. A specimen in the Judd collection at Kanab measured: Height, 12¼ inches; greatest diameter, 12½ inches; greatest circumference, 3 feet 9¼ inches; outside diameter of orifice, 5½ inches; inside diameter of orifice, 4¾ inches. A few small pitchers. This belongs to the latest, masonry house period.

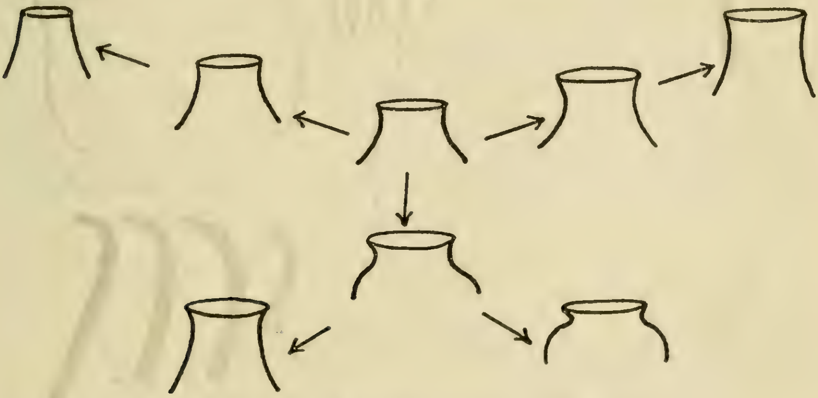

FIGURE 44.—Variations in rims of plain ollas.

Red-on-tan.—One sherd only (11907)[2] of this novel ware, site 142. Paste: Coarse, tan. Temper: Quartz.

Incised ware.—Mr. Neaf Hamblin of Kanab has 3 similar pots found by him in a grave a few miles southeast of Johnson Canyon. One of these, 11904, loaned the University of Utah, is totally unlike the other wares found in the region, but closely resembles "Jemez

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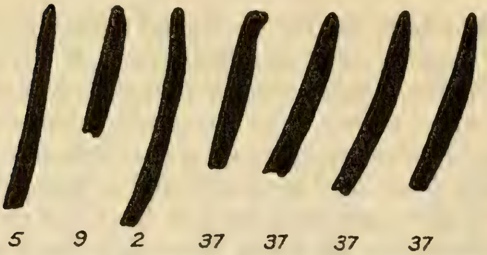
[2] Numbers of specimens are those of the catalog of the Museum of Anthropology, University of Utah.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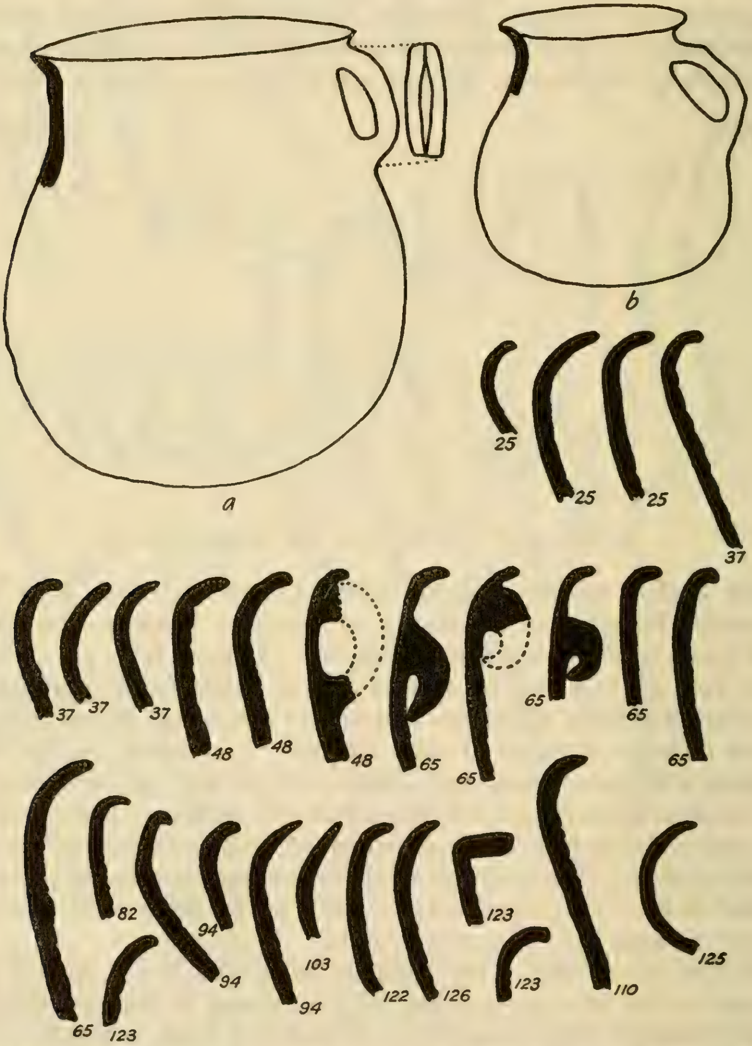
37

FIGURE 45.—Rim sherds of Paria gray bowls. Numbers indicate sites in Johnson Canyon-Paria River region.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125
65
123

FIGURE 46.—*a*, *b*, Johnson corrugated pitchers, site 123, Dairy Canyon. *a*, 5⅝ inches tall. Corrugated olla rim sherds. Numbers indicate sites in the Johnson Canyon-Paria River district.

incised" (Jeancon, 1923, pp. 54–57) or Potsuwi'i incised (Mera, 1932) of the upper Rio Grande, Pueblo IV period.

Paste: Medium fine, rich brown. Finish: No slip or polish but well smoothed. Shape: Jar, 6⅜ inches high; widest body diameter, 8⅛ inches; rim diameter, 5¼ inches; wall thickness, 6 to 8 mm.; slightly outcurving rim; steeply sloping shoulder; lower half, including bottom, rounded; bottom drilled with hole in center, ⅝ of an inch in diameter. Decoration: Shoulder bears large triangles which alternately project up from turn of shoulder and hang down from under rim, each paralled hatched with fine incised lines; crude punches or shallow pits, spaced ½ inch apart, encircle the neck, just under the rim.

The only conceivable interpretation of the presence of these jars in the Johnson Canyon region is that they were left by a small group which wandered far afield from its home in the upper Rio Grande. This, however, may be the ware mentioned by Judd (1926, p. 45).

The following table gives the major kinds of pottery (not named wares) occurring at different sites. Plain gray, for example, may be Paria gray or Johnson gray-tan, the former usually occurring at earlier sites, the latter at later ones. Percentages are given when the samples are sufficiently large. At such sites, sherds were collected, as nearly as is humanly possibly, at random.

TABLE 3.—*Major kinds of pottery occurring at different sites*

Site	Total sherds	Plain gray		Corrugated		Black-on-white		Black-on-red		Red		Polychrome		Black-on-white corrugated		Fugitive red	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
2	232	201	87	2	0.8	24	10.2	----	----	----	----	----	----	----	----	5	2
3	58	51	88	----	----	7	12	----	----	----	----	----	----	----	----	----	----
4	25	3	12	13	52	2	8	3	12	----	----	----	----	1	4	3	12
5	20	20	100	----	----	----	----	----	----	----	----	----	----	----	----	----	----
6	(?)	(?)	100	----	----	----	----	----	----	----	----	----	----	----	----	----	----
7	19	16	----	2	----	1	----	----	----	----	----	----	----	----	----	----	----
9	39	35	90	----	----	4	10	----	----	----	----	----	----	----	----	----	----
10	19	19	100	----	----	----	----	----	----	----	----	----	----	----	----	----	----
12	(?)	(?)	100	----	----	----	----	----	----	----	----	----	----	----	----	----	----
13	17	12	----	3	----	2	----	----	----	----	----	----	----	----	----	----	----
15	4	4	100	----	----	----	----	----	----	----	----	----	----	----	----	----	----
18	9	6	----	3	----	----	----	----	----	----	----	----	----	----	----	----	----
21	24	16	67	----	----	8	33	----	----	----	----	----	----	----	----	----	----
23	17	7	----	10	----	----	----	----	----	----	----	----	----	----	----	----	----
24	8	8	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
25	221	44	20	88	40	43	19.3	32	14.4	10	4.5	0	----	2	.9	2	.9
26	27	27	100	----	----	----	----	----	----	----	----	----	----	----	----	----	----
28	5	5	100	----	----	----	----	----	----	----	----	----	----	----	----	----	----
30	11	4	----	6	----	0	----	1	----	----	----	----	----	----	----	----	----

TABLE 3.—*Major kinds of pottery occurring at different sites*—Continued

Site	Total sherds	Plain gray		Corrugated		Black-on-white		Black-on-red		Red		Polychrome		Black-on-white corrugated		Fugitive red	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
31	3	0		3													
32	27	22	81.4	1	3.7	4	14.9										
34	55	52	94.5	0		3	5.5										
36	6	4		1		1											
37	49	16	32.6	28	57.3	3	6.1									2	4
39	25	24	97	0		1	3										
41	72	64	88.8	2	2.7	6	8.3							2	1.2		
42	43	39	90.7	1	2.4	3	6.9										
44	7	5		1		1											
45	7	3		1		3											
46	148	48	32.4	69	46.6	21	14.1	7	4.7	3	2.2						
47	13	3		3		5		1						1			
48	536	110	20.5	194	36.1	140	26.1	46	8.5	33	6.1	1		12	2.2		
49	18	15		0		2		0		1							
50	18	12		6		0											
51	25	21	84	0		4	16	0									
52	26	25	96	0		1	4										
53	236	92	38.8	64	27.6	34	14.4	22	9.3	20	8.3	0		4	1.6		
54	144	49	34	40	27.7	25	17.3	19	13.2	7	4.8	1				3	2
55	132	71	53.8	52	39.3	5	3.8	0		4	3.1						
56	20	15		1		4		0									
57	15	7		0		0		7				1					
58	23	20	87	0		3	13										
59	8	5		2		0				1							
60	49	30	61.2	10	20.4	4	8.2	5	10.2								
61	14	0		8		5				1							
62	30	13	43.3	13	43.3	3	10	1	3.4								
63	14			10		2		1		1							
64	6	1		1		3		1									
65	258	31	12	154	59.9	8	3.1	24	9.6	30	11.2	2	.7	9	3.5		
66–70	300	298	99.3			2	.7										
71	43	42	97.9			1	2.1	0									
72	172	42	24.4	60	34.8	25	14.5	18	10.4	22	12.7			5	3.2		
73	190	47	24.7	78	41	26	13.6	17	8.9	22	11.8						
76	222	59	26.5	83	37.3	26	11.7	19	8.5	31	13.9			4	2.1		
78	209	49	23.4	73	34.9	26	12.4	23	11	37	17.6	1	.7				
79	10	2		4		2		2									
80	247	73	29.5	91	36.8	28	11.3	33	13.3	22	9.1						
82	21	4		13		0		3				1					
83	23	1	4.5	10	43.4	12	52.1										
85	20	0		11		6		3									
87	13	9		0		4											
92	2	0		2(?)		0											
93	2	0		2(?)		0											
94	265	93	35	86	32.4	33	12.8	29	10.8	22	8.3	2	.7				
95	186	41	22	83	44.6	20	10.7	23	12.3	19	10.4						
98	8	4		2		2											
99	20	3		8		3		2		2						2	
102	13	5		5		3		0									
103	12	4		7		0		0						1			
110	323	68	21	137	42.4	52	16.1	26	8.1	37	11.4	3	.1				
111	20	9		8		3		0									
113	12	4		4		4		0									
116	11	11				0		0									
119	95	3	3.2	57	60	25	26.3	(?)		10	10.5						

TABLE 3.—*Major kinds of pottery occurring at different sites*—Continued

Site	Total sherds	Plain gray		Corrugated		Black-on-white		Black-on-red		Red		Polychrome		Black-on-white corrugated		Fugitive red	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
120	121	98	81.3	7	5.7	14	11.4	0	------	1	.8	0	----	1	.8	----	----
122	44	8	18.1	16	36.3	20	45.4	0	------	----	------	----	----	----	----	----	----
123	82	0	------	64	78	18	22	0	------	----	------	----	----	----	----	----	----
124	15	7	------	1	------	7	------	0	------	----	------	----	----	----	----	----	----
125	19	1	------	8	------	7	------	2	------	1	------	----	----	----	----	----	----
126	74	0	------	68	92	6	8	0	------	----	------	----	----	----	----	----	----
131	18	11	------	6	------	1	------	0	------	----	------	----	----	----	----	----	----
137	11	0	------	8	------	0	------	0	------	2	------	1	----	----	----	----	----
139	3	3	------	0	------	0	------	0	------	----	------	----	----	----	----	----	----
140	12	10	------	1	------	1	------	0	------	----	------	----	----	----	----	----	----
142	40	8	20	13	32.5	16	40	2	5	1	2.5	----	----	----	----	----	----

Objects made of potsherds.—A number of sherds were ground to roughly oval shape, perhaps for scoops or pot scrapers. These are: 11709, a fragment bearing fugitive red from site 25; 11830 and 11831, fragments from plain red sherds from site 65; 11876, a fragment made from a black-on-white sherd from site 99; 11849, 2 complete specimens made from plain gray olla sherds from site 73, the larger being 3⅝ inches long, 1⅞ inches wide, and 11851, a similar fragment from site 73.

TABLE 4.—*Sherds ground to circles*

[Measurements in inches]

Site	Catalog No.[1]	Ware	Diameter	Diameter hole	Remarks
25	11710-1	Black-on-white	1⅝	------------	No hole.
25	11710-2	do	2⅛	------------	Do.
48	11804	do	1⅛	------------	Do.
48	11804	do	1⅛	------------	Do.
48	11804	do	1	------------	Do.
48	11804	Red	1⅜	------------	Do.
48	11804	do	1⅜	------------	Do.
48	11804	Plain gray	1¼	------------	Do.
48	11804	do	1 1/16	------------	Do.
48	11804	Red	2	½	
56	11819	Black-on-white	1⅛	------------	Do.
65	11829	Red	1⅞	¼	
71	11841	Plain gray	1⅛	------------	Do.
72	11840	Red-on-orange	1⅜	¼	
72	11840	Black-on-red	1½	3/16	
72	11840	Corrugated	1⅝	¼	Broken.
72	11840	Red	2±	3/16	Do.
73	11850	Brown-on-brown	1⅛	3/16	
73	11851	Plain gray	1⅛	------------	No hole.
96 (?)	11868	White	1¼	(?)	
115	11912	Plain gray	1⅞	3/16	Broken.
115	11913	do	2⅛	------------	No hole.
119	11893	Black-on-gray	13/16	------------	Do.
119	11893	Brown-on-gray	13/16	------------	Do.

[1] Museum of Anthropology, University of Utah.

A number of sherds were ground to circles, some but not all being perforated in their centers with small holes. These are tabulated on page 309, the measurements being in inches.

SUBSISTENCE

Domesticated plants.—There is no evidence to prove that horticulture belonged to the earliest period as specimens of domesticated plants came only from caves which had been disturbed by previous digging.

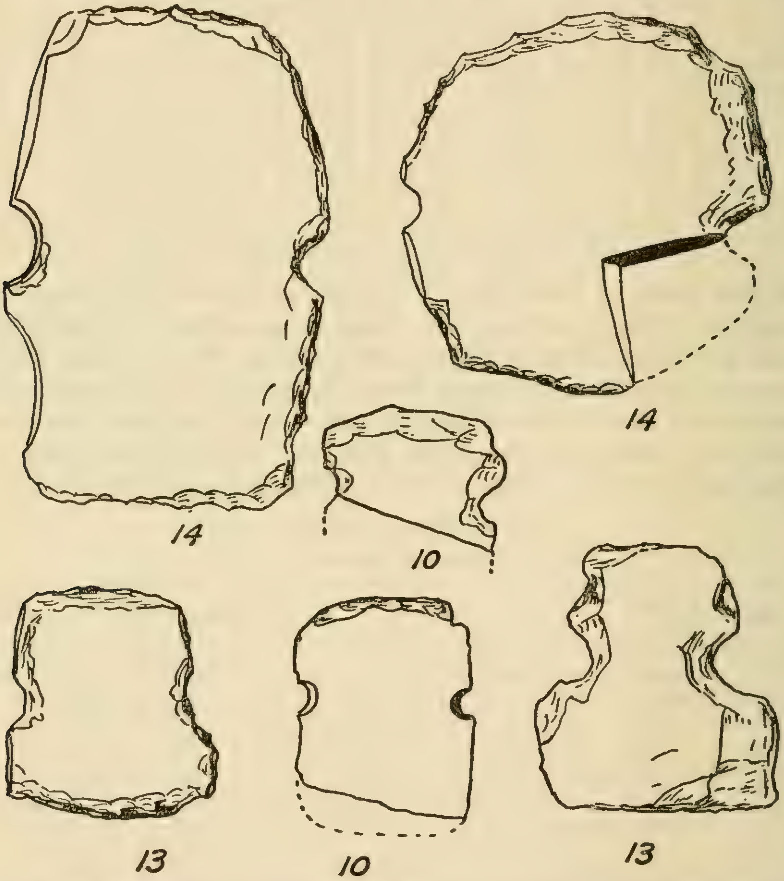

FIGURE 47.—Chipped sandstone "hoes." Numbers indicate sites in the Johnson Canyon-Paria River region. The largest is 12 inches long.

Site 2 yielded 15 specimens of maize, complete ears ranging from 1¾ inches to 5⅗ inches in length and having usually 6 but sometimes 4 or 5 double rows of kernels. Sites 18, 37, 98, 113, and 131 also had similar maize.

Site 2 also yielded three small, yellow, nondent kernels of maize, a squash stem, and fragments of squash or gourd, and a red bean. Site 98 contained a brown bean (11874).

"Hoes."—Sites 10, 13, and 14 yielded several thin slabs of sandstone heavily impregnated with iron. The edges were chipped and notched (fig. 47), as if they had been hafted as hoe blades, although there is no proof of this. A number were strewn in a meadow which would have made an excellent cornfield. Gillin (1938, fig. 25) found a somewhat comparable object in Nine Mile Canyon in northeastern Utah.

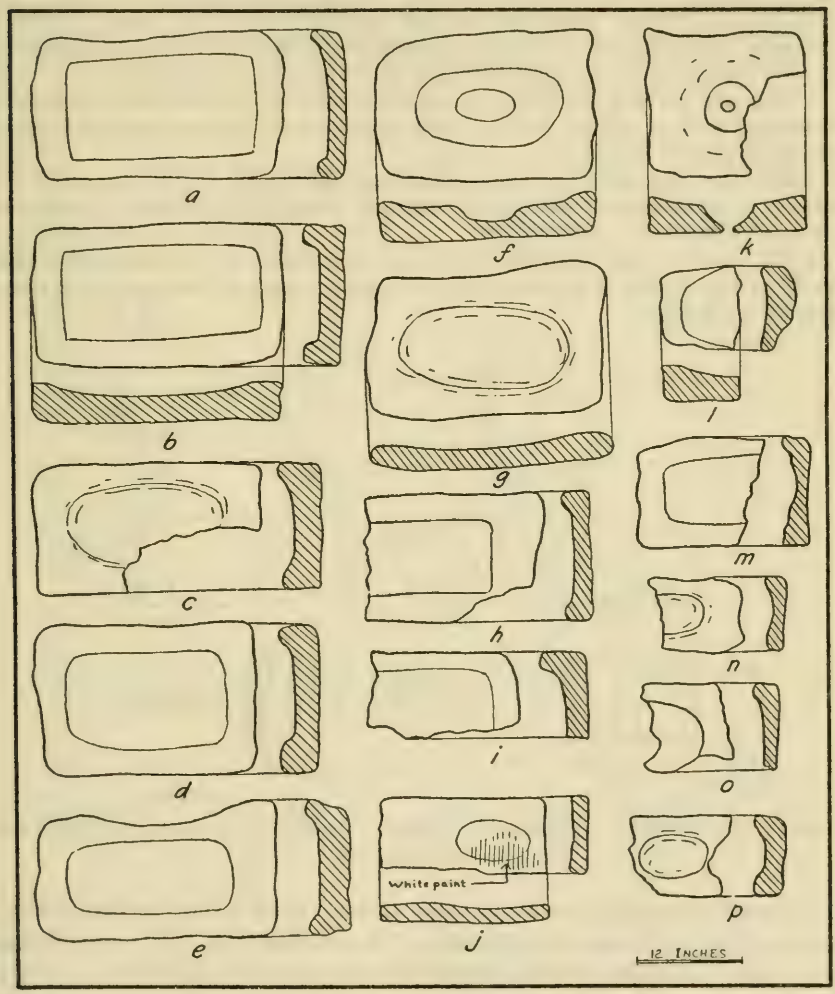

FIGURE 48.—Metates

a, b, g, h, i, m, Site 45; *c,* site 58; *d,* site 73; *e,* site 79; *f,* site 42; *j, k,* site 2; *l,* site 10; *n, o,* site 53; *p,* site 62. Johnson Canyon-Paria River region.

11770, site 14, iron sandstone; length, 12 inches; width, 8 inches in center, tapering to 6 inches at each end; thickness, ⅜ of an inch to ½ of an inch; notch cut in middle of each side, 1 inch deep, 2 inches wide; edges crudely chipped from both sides to sharpness.

11766, site 10, iron sandstone; probably broken; length, 6½ inches; width, 6 inches, tapering to one end; deep notches in opposite sides, 3 inches from small end; thickness, ⅝ of an inch; edges partly chipped to sharpness.

11765, site 10, iron sandstone; one end broken; length, 5½ inches; width, 4 inches to 4½ inches; edge of end sharpened; remaining edges square; thickness, 7/16 of an inch; notches on opposite edges 2½ inches from small end.

11768, site 13, iron sandstone; squarish; length, 5½ inches; width, 5 inches; thickness, ⅜ of an inch to ½ of an inch; notches in middle opposite edges; edges mostly chipped to sharpness.

11769, site 13, fragment; iron sandstone; present length, 3¾ inches; width, 4½ inches; edges sharpened except left side and broken end; notches on opposite sides, 2 inches from unbroken end.

11771, site 14, iron sandstone; circular, approximately 9½ inches diameter; 5/16 of an inch thick; edges chipped to sharpness; traces of two notches in edges opposite each other.

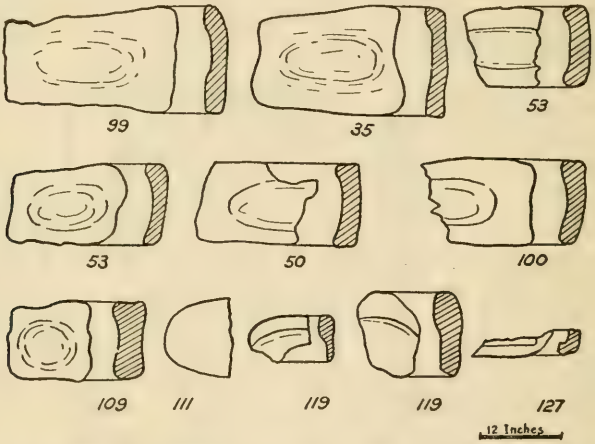

FIGURE 49.—Metates. Numbers indicate sites in the Johnson Canyon-Paria River region.

Metates.—Metates were of two styles, both being of sandstone, rectangular and moderately thick. The earlier type, A, generally has an ovoid, basinlike grinding depression (figs. 48, *c*, *f*, *g*, *j*, *l*, *n*, *o*, *p*; 49). The later type, B, is better squared and finished and has a rectangular grinding surface (figs. 48, *a*, *b*, *d*, *e*, *h*, *i*, *m*; 49). Some chronological overlapping of types is indicated, for example at site 45, where a specimen of type A was associated with a large number of type B.

Although deeply troughed metates of the Basket Maker type are known from the Zion Park region (Smith, 1934), the only specimen definitely of this type from our region is from site 142, which, judging by the masonry walls, was late. Another specimen at site 119 may have been similar. Types A and B specimens bear slight resemblance to the Basket Maker style in having a broad rim. But in these specimens the rim completely surrounds the grinding surface whereas in Basket Maker specimens the rim bounds it on only three sides. Flat metates, designed for a bin, like those of the later Pueblo cultures, were absent from the region.

The metates illustrated in figures 48 and 49 are from field measurements and sketches. Difficulties of transportation prevented collection of specimens.

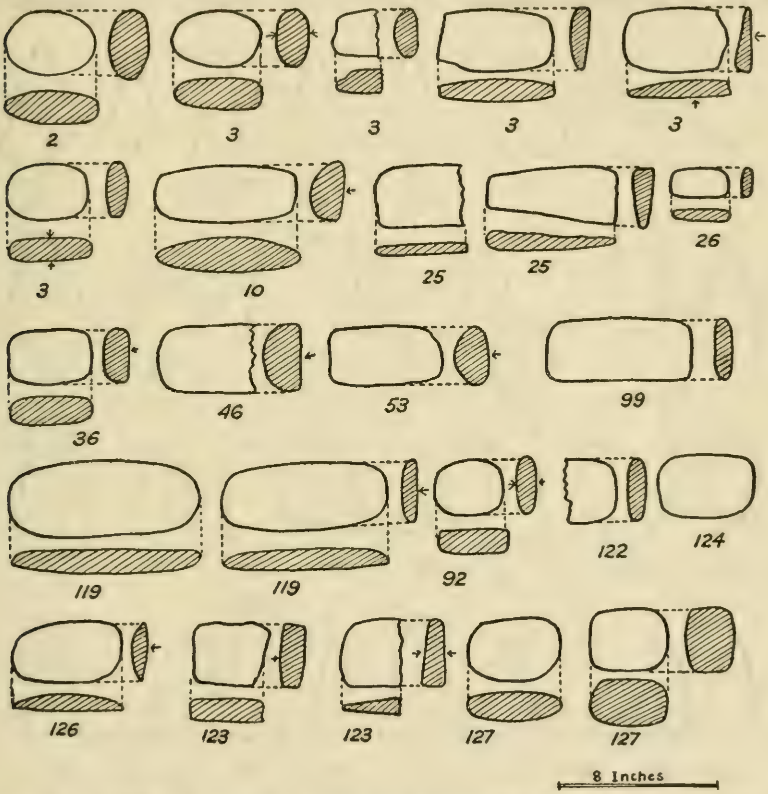

FIGURE 50.—Mullers or manos and cross sections of same. Numbers indicate sites in the Johnson Canyon-Paria River region.

Mullers.—Mullers, although extremely variable in shape and size, are usually between an oval and rectangle in outline. Those from early sites (fig. 50, sites 2, 3, 26, 92, 126, and 127) are smaller and more oval, thus being suited to the smaller and more oval grinding surface on the metate. Those from later sites are larger and more rectangular (fig. 50, sites 25, 46, 53, 99, 119) in keeping with the more definitely rectangular and flat depression on the metates. There is some overlapping of the types, however. Although most cross sections are oval, wear has often produced a wedge shape. Many are pecked on the grinding surface as if they had been roughened from time to time. Some specimens are pecked on the side opposite that smoothed from grinding, as if this side were used for preliminary heavy grinding and smashing.

Figure 50 illustrates specimens measured in the field as well as those collected.

Projectile points.—Evidence of hunting is seen in petroglyphs as well as in projectile points. Many of the former, discussed below, show clearly the bow and arrow. But as these can only be dated by inference, they have little value in the present connection.

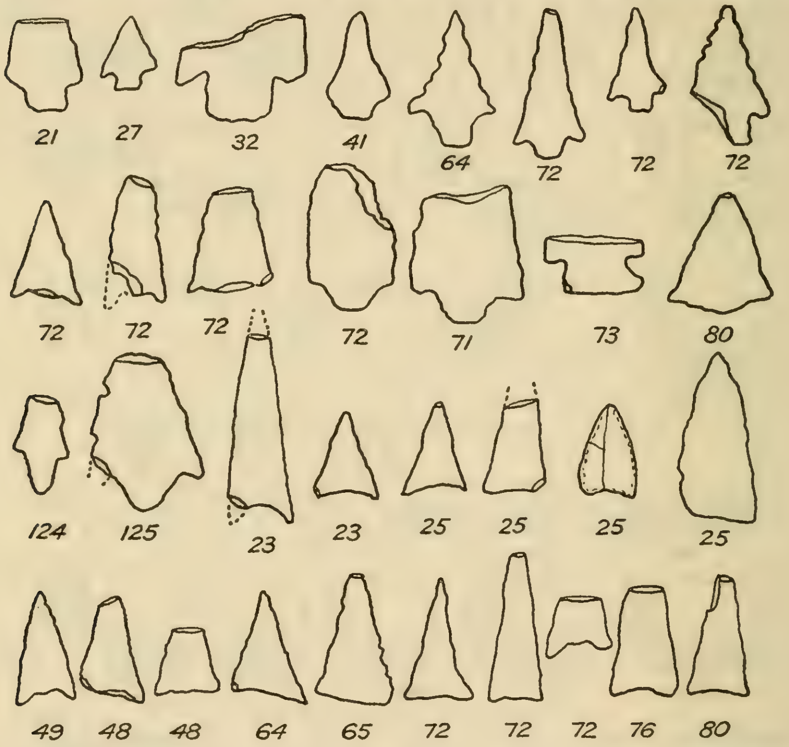

FIGURE 51.—Projectile points of chipped flint. Numbers indicate sites in the Johnson Canyon-Paria River region.

Most projectile points are relatively small and are of flint, chert, jasper, and somewhat opalescent or translucent flint. Two types are distinguishable on the basis of presence or absence of notching (fig. 51).

Type A is notched from the corners of the base so as to leave a long, slender tang but no barbs. It varies from $^{11}/_{16}$ of an inch to 1½ inches in length. These occur more often at early sites. Only one specimen

(11852), site 72, is side-notched like Basket Maker atlatl dart points.

The later type B is a slender, triangular point with a concave base and no notches. These range from $^{13}/_{16}$ of an inch to over 1¾ inches in length. Several points from site 72, however, have a slight tang within the concave base. This site is also of interest in that both types A and B were found here although architecturally and ceramically the site is late. Site 64 also had both styles.

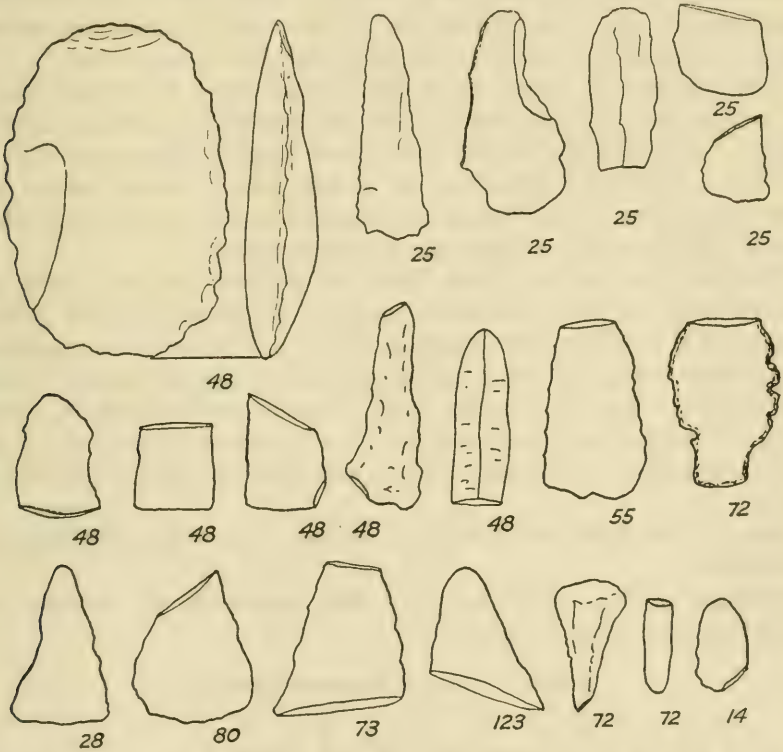

FIGURE 52.—Knives, drills, and scrapers. Numbers indicate sites in the Johnson Canyon-Paria River region. The largest is 3¾ inches long.

INDUSTRIES

Axes.—The only stone ax known from this region is in the Judd collection at Kanab. It is crudely shaped of brown quartzite, 7 inches long, 4 inches wide, 1¾ inches thick. In place of a groove, it bears shallow notches on opposite edges. One end is sharpened, the other rounded, bearing a shallow notch.

Knives, drills, and scrapers.—Cutting implements are so variable that it is impossible to define types and often even to distinguish knives from scrapers. Most of the specimens, however, appear to have been knives, ranging around 2 inches in length. Some are triangular, some roughly oval, some have squared butts, and others are extremely irregular, the shape not being consistent in any site. (See fig. 52.)

A number of small, oval flints are probably scrapers. Only one scraper (11746) from site 2 is a fragment which is retouched from one surface only, although this manner of chipping is very common elsewhere.

Several scrapers are mere irregular, unretouched flakes: 12048, 4 from site 25; 12050, 2 from site 41; 12052, 1 from site 51. Of particular interest is the large flake (11842, fig. 52) from site 72, which has several deep serrations or notches in the edge and shows great wear.

Two specimens, 11842, from site 72 appear to be drills. One is 1½ inches long, 13/16 of an inch wide at the butt with a slender, tapering point. The other is a slender point 1 inch long, 5/16 of an inch wide.

Bags.—The Judd collection at Kanab has a woven cotton bag from somewhere in the region. It contains seeds or leaves and white paint. There is also a fragment of cotton cloth.

Baskets.—No basketry was found at any site visited during the survey, but the Judd collection contains a complete coiled basket. Although it is not possible to assign this to any period, it is important in demonstrating the local occurrence of the usual Basket Maker-Pueblo technique. It is a flat bowl, 11 inches in diameter, 2⅜ inches deep. Foundation: 2 rods and bundle of crushed yucca leaf. Coils: Noninterlocking, 16 stitches per linear inch or 80 stitches per square inch.

Also in the Judd collection is a twilled ring basket, 3½ inches in diameter.

Cordage.—Data concerning the few fragments of cordage are summarized in table 5 below:

TABLE 5.—*Data on fragments of cordage*

Site	Catalog No.[1]	Number of plys	Direction of twist	Diameter *Inches*	Material	Remarks
2	11718	2	Clockwise	3/32	Yucca	2 strands, weaver's knot.
2	11718	1	do		do	Tied square knot.
2	11718	1	do		do	Do.
2	11873	2	Counterclockwise	⅛	do	Do.
2	11752	1	do		do	Do.
2	11872	1	do		do	Do.
2	11738	2	Clockwise	1/16	Fiber	Laced through buckskin.
131	12046	2	do	3/32	Soft fiber	Do.
131	12046	2	do	1/16	Hard fiber	Do.
131	12046	2	do	1/32	Soft fiber	Do.

[1] Museum of Anthropology, University of Utah.

In addition to these, site 2 yielded several bunches of shredded yucca fiber and what is probably a yucca quid.

The Judd collection in Kanab has a human-hair rope from this vicinity. It is 3½ feet long and consists of 16 strands, each two-ply and all twisted counterclockwise. The end is formed by doubling the strands back on themselves and tying them at the point of doubling with a small cord.

Textiles.—Although no textiles were found, a lump of clay, 11890, site 116, bears an impression (fig. 53) which may have been made by a sandal bottom of the ornamented type common in the Basket Maker III culture.

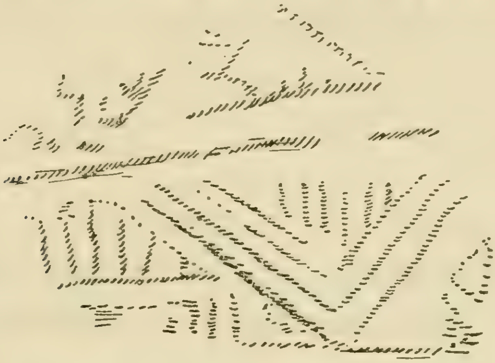

FIGURE 53.—Textile impression in adobe.

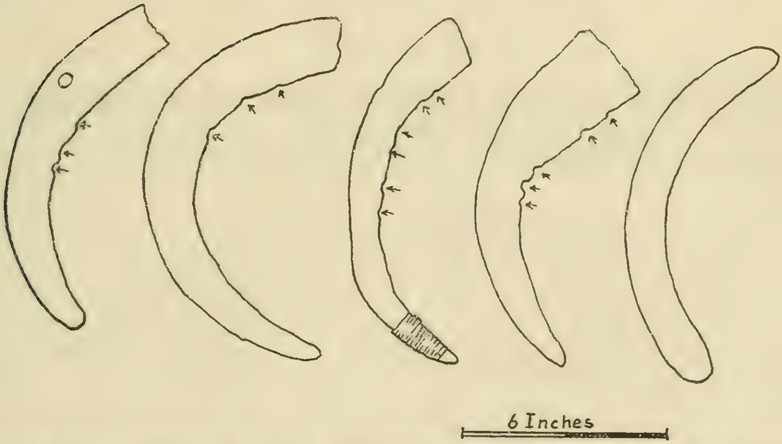

FIGURE 54.—Crescent ("sickles") of mountain sheep horn in the Judd collection at Kanab, Utah. Arrows indicate worn grooves.

Awls.—11721, site 2, is a fragment of a very stubby, blunt awl. The Judd collection contains three awls tied in buckskin.

Horn crescents.—The Judd collection contains five flat, crescentic objects made of mountain-sheep horn (fig. 54). These resemble so-called sickles from certain Basket Maker sites and might be interpreted as sickles were it not for small, worn grooves on the inner edges which look as if cords had been drawn repeatedly across them. These range from 8½ inches to 9½ inches, tip to tip. One has its small end wrapped with cord. Another is perforated near the large end.

Dippers.—The Judd collection has three wooden dippers of the bowl-and-handle variety (fig. 55), taken from "cists in solid rock" in a cave at the head of Dairy Canyon. The measurements of these are:

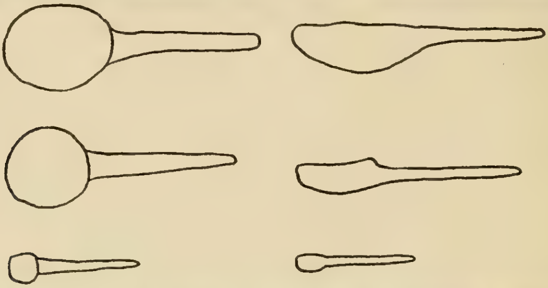

FIGURE 55.—Wooden dippers in the Judd collection at Kanab, Utah.

Bowl length, inches	*Bowl width, inches*	*Bowl depth, inches*	*Handle length, inches*
6	5	2½	8
4½	4½	1½	8
1½	1¾	⅞	5½

Hammerstone.—The only hammerstone collected was from site 123 (11920), a fragment of water-worn quartzite pebble, about 2¼ inches in diameter, having one edge used slightly for pecking.

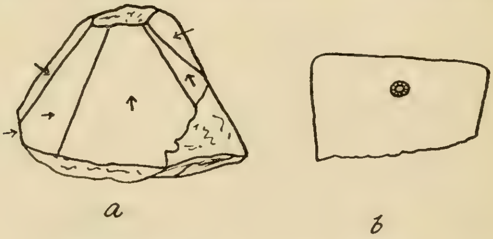

FIGURE 56.—Two quartz objects.

a, Quartzite lump (11744), site 2, Paria River region. Arrows indicate facets. *b*, Crystalline pendant (11894) site 119, Johnson Lakes Canyon.

MISCELLANEOUS

Stone objects.—A sandstone slab (11739) from site 2 is approximately 6 inches square, its smooth upper surface bearing a pastel shade of greenish-blue paint.

An irregular quartzite lump (11744) from site 2 has several facets produced by rubbing (fig. 56).

A small sandstone slab (11730) from site 2 is covered with some substance, possibly resin.

Site 123 had a fragment of unworked petrified wood (11917).

Ornaments.—These included a half *Olivella* shell bored with a small hole (11720) from site 2 and an excellently trimmed and polished pendant fragment of semitranslucent crystalline stone (11894) (fig. 56) from the burial at site 119. The latter is 1½ inches wide, ⅛-inch thick.

Animal remains.—Site 2 yielded several turkey feathers (11731, 11741) and site 4 several turkey (?) bones (11758).

Site 131 had a bundle of 45 hawk feathers, 12 inches long (11900), their butts bound together by a small, two-ply fiber cord wrapped six times around them.

SKELETAL MATERIAL

The only skeletal material came from two partially exposed burials at site 119, which is of the latest period ceramically and architecturally. It is noteworthy that these are distinctly Basket Maker rather than Pueblo in type. Both skulls are adults, long and undeformed. One has a cephalic index of approximately 70, which may, however, have been deformed in the soil. It has high orbits, an occipital bulge and something of a ridge where the parietals join.

PETROGLYPHS

Site 1.—A group of petroglyphs on the north side of the mouth of Molly's Nipple Canyon. Figure 57, *a*, group 3½ feet wide; *b*, 24 inches tall; *c*, 12 inches long; *d*, group 10 feet wide; *e*, 6 inches tall; *e*, group 4½ feet wide.

Site 4.—Petroglyphs on wall of masonry cliff house. Figure 57, *f;* pecked group 22 inches wide.

Site 7.—Figure 58, white pictographs in rock shelter: *a*, 7 inches wide; *b*, 4½ inches wide; *c*, 13 inches tall; *d*, group 18 inches wide; *o*, petroglyph 10 feet long.

Site 29.—Figure 58, pictographs in white and black, in small cave or rock shelter: *e*, *f*, white-on-black; *g*, creamy white, 12 inches across; *h*, 12 inches across; *i*, *j*, black; *k*,*l*, paper white group, 2¼ feet across; *m*, creamy white group, 2½ feet across.

Site 40.—Petroglyph 10 feet 8 inches long, on rock on floor of canyon; very similar to that at site 7. In addition, pictographs in white include zig-zags and rectilinear figures somewhat resembling pottery designs.

Site 111.—Figure 59, *a*, pictographs in Long Canyon in blue-green (plain), purple (shaded upward to left), and red (shaded upward to right) in cave associated with masonry rooms; *b*–*j*, petroglyphs. Figure 60, *a*–*f*, also petroglyphs.

Site 117.—Figure 61, petroglyphs on cliff in James Bunting's corral: *a*, group, 3 feet tall, pecked and rubbed smooth; *c*, apparently more recent than last, dull gray on faded black, 24 inches tall; *d*, like last, 12 inches tall; *e*, pecked 10 inches tall; *f*, incised group, double ended figure 13 inches tall; *g*, *h*, parts of same group of petroglyphs about 6 feet across. Plates 46, 47, large group of petroglyphs with last.

Site 121.—A group of four petroglyphs, dumbbell shape, each 18 inches long, 6 inches wide; also two spirals.

Site 130.—Petroglyphs stretching 100 feet or more along cliff on north side of mouth of Oak Canyon. Figure 62, portion of the group. Figure 63, *a*, group 8 feet across. Plate 48, continuous group, left to right.

Site 132.—Small group of petroglyphs, 24 inches wide, on wall inside masonry cliff house (fig. 63, *b*).

Site 133.—Figure 63, *c–f*, petroglyphs pecked on cliffs on south side of the mouth of Oak Canyon. Being 10 feet from the ground, they could have been reached only if the artist stood on something; but there were no signs of houses below them. *c*, 3½ feet wide, incised 1 inch deep; *d*, incised, 24 inches across; *e*, like last, 18 inches tall; *f*, 9 inches square.

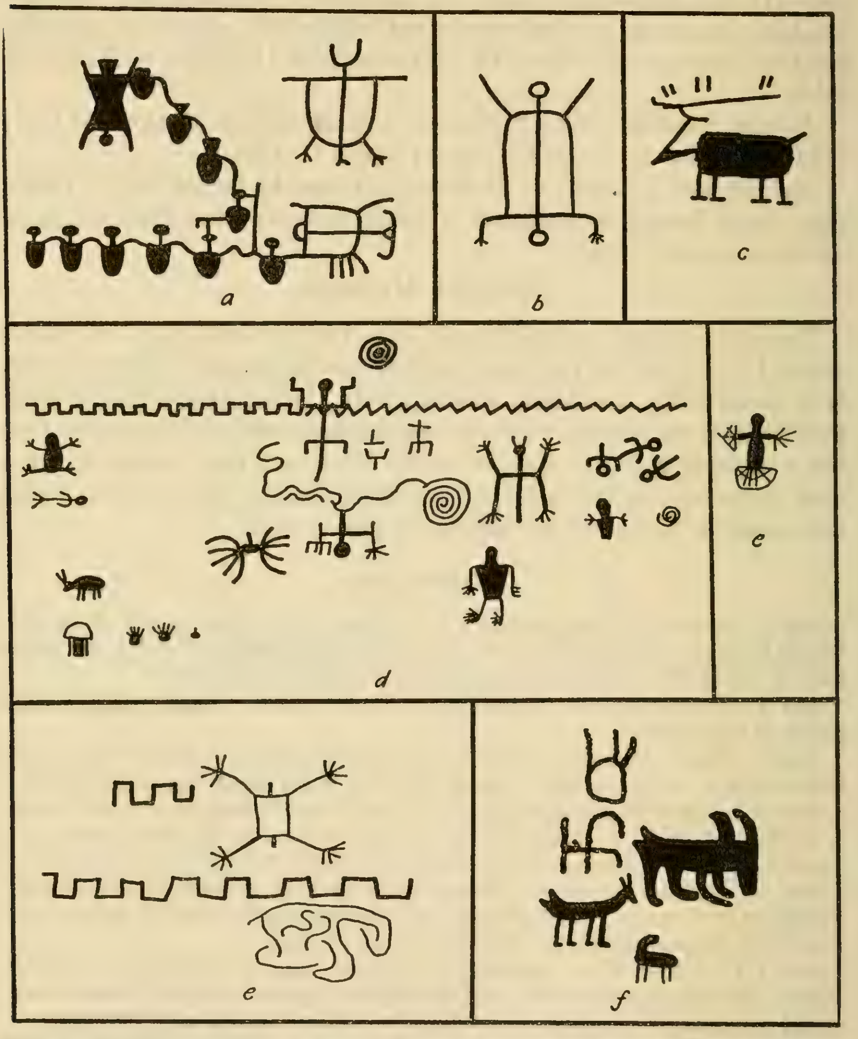

FIGURE 57.—Petroglyphs, *a–e*, site 1, and *f*, site 4, Molly's Nipple Canyon.

Site 141.—Figure 63, *g–k*, petroglyphs.

The petroglyphs in this area resemble those throughout western America in possessing certain common elements (Steward, 1929): Spirals (especially site 117, pl. 47; site 111, fig. 60; site 1, fig. 57, *d;* site 29, fig. 58, *k*), concentric circles (site 117, pl. 47; site 130, pl. 48;

site 1, fig. 57, *d*), "sun disks" (site 130, pl. 48, fig. 63), wavy and zigzag lines (especially site 117, pl. 47; site 130, pl. 48; and elsewhere).

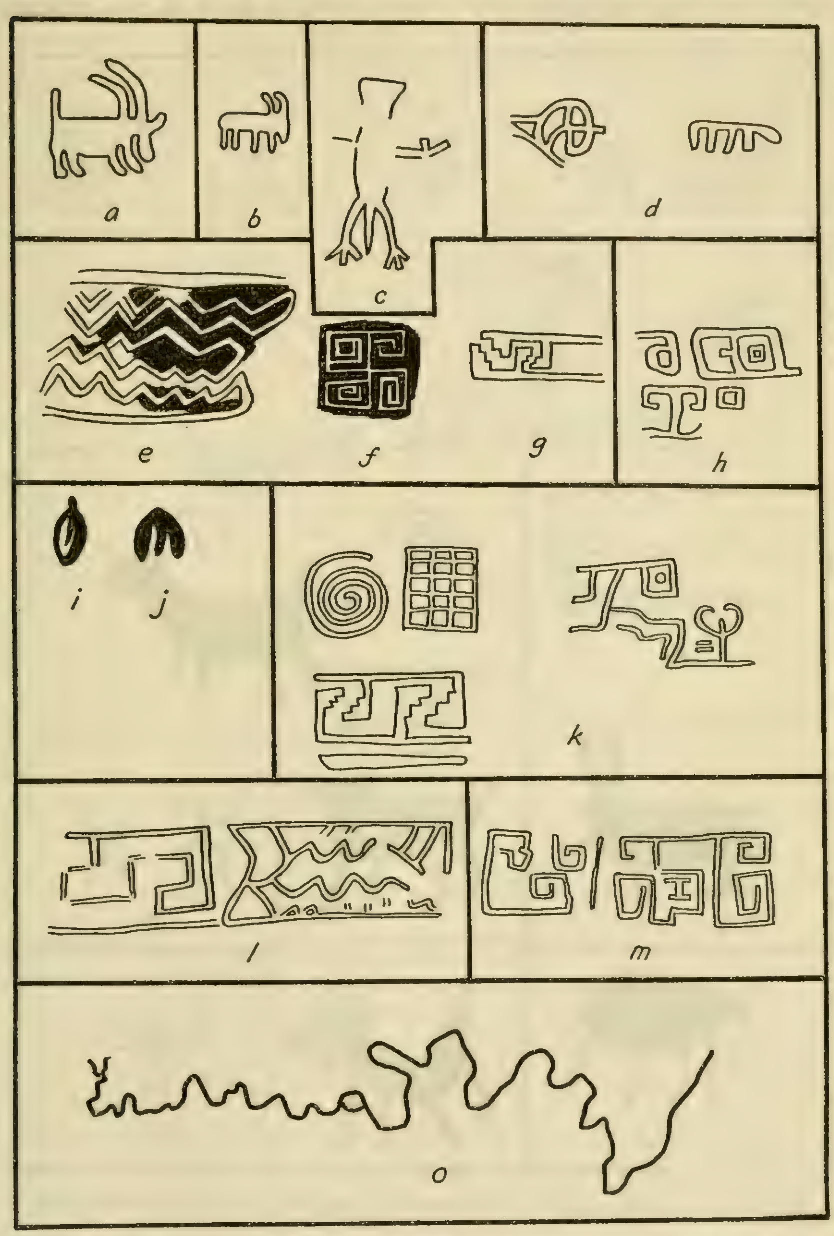

FIGURE 58.—Pictographs, *a–d*, *o*, site 7, Molly's Nipple Canyon, and *e–m*, site 29, Wildcat Canyon.

The most common realistic picture is a square-shouldered, anthropomorphic figure, derived from a simple style which started in Basket

Maker II times.[3] Several variations of this were at site 1 (fig. 57) and site 117 (fig. 61). A peculiar, probably local, style at each of these sites is a "double-ended" figure with a head at the top and bottom (fig. 57, *b*, *d*, *e;* fig. 61, *f*). Other forms derived from the square-shouldered figure occur at site 7 (fig. 58), site 111 (fig. 60), site 130 (pl. 47), and site 130 (figs. 62, 63; pl. 48). Although most of

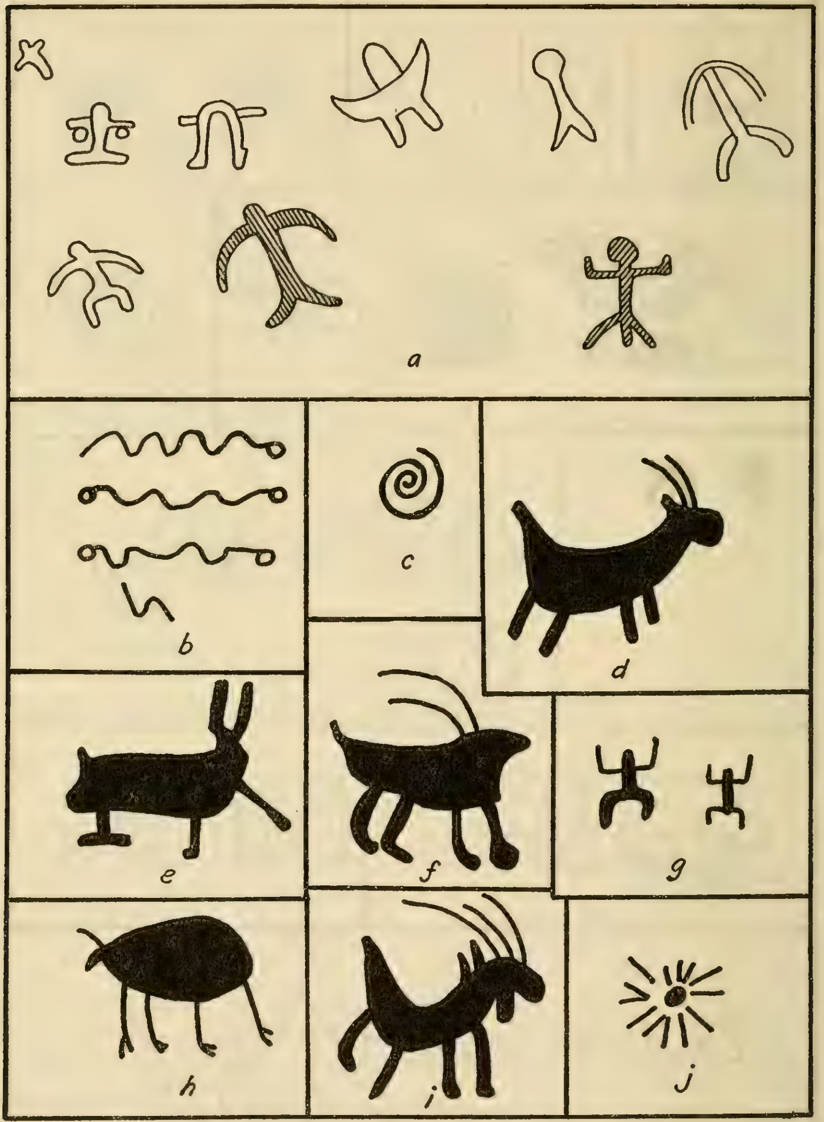

FIGURE 59.—Pictographs and petrolgyphs, site 111, near Johnson Canyon.

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[3] For example, in Dupont Cave, Kane County, Utah.

these appear to be Basket Maker drawings, their association at site 130 with representations of the bow place them as Pueblo. Special attention should be called to the hunchback flute player at site 130 (fig. 63, *a*). Of particular interest are the hunting scenes depicting use of the bow at site 130 (pl. 48), and site 141 (fig. 63, *h*, *k*). Several peculiar, highly conventionalized anthropomorphic pictographs were at site 111 (fig. 59, *a*).

Several animal species in varying styles are distinguishable with reasonable certainty: Mountain sheep (site 1, fig. 57; site 7, fig. 58, *a*; site 111, fig. 59, *d* (?), *e* (?), *f* (?), *i* (?); site 117, pl. 47; site 130, pl. 48; and site 141, fig. 63, *h*); possibly some antelope; deer or other antlered quadrupeds (site 1, fig. 57, *c;* site 111, fig. 60, *a*, *e;* site 117, pls. 46, 47; site 130, fig. 62, *a;* pl. 48); a bison (site 117, pl. 46); various other quadrupeds; a centipede (site 130, pl. 48). Snakes may be represented at several sites.

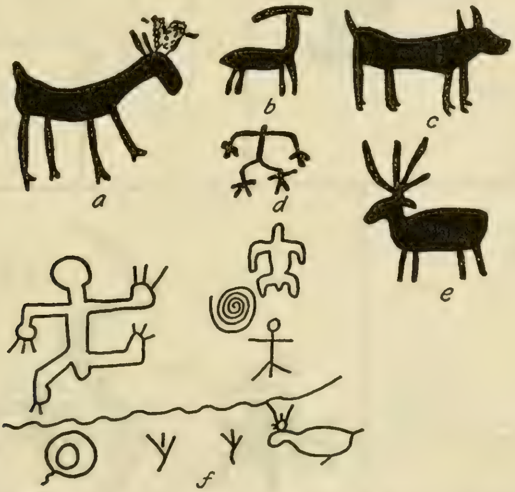

FIGURE 60.—Petroglyphs, site 111, near Johnson Canyon.

Human or bear footprints appear at site 1 (fig. 57, *d*) site 117 (pl. 47), and site 130, (fig. 62, *b*, pl. 48). Site 130 (pl. 48), has a human hand. Site 111 (fig. 60, *f*), site 117 (fig. 61, *g*), and site 130 (fig. 63, *a*) have bird tracks.

Several sites had geometric designs which appear to have been derived from pottery ornamentation, especially site 29 (fig. 58, *e–m;* also site 130 (pl. 48).

PART 2. GLEN CANYON OF THE COLORADO RIVER

Glen Canyon comprises the 170 miles of tortuous Colorado river gorge which lies between the mouth of the Fremont (Dirty Devil) River in Utah and Lee's Ferry, Ariz. Although the river is relatively calm through this stretch, and lacks such rapids as make Cataract Canyon above and Marble Canyon below dangerous to travel, the gorge is narrow and sheer cliffs rise out of the water for stretches of miles leaving few sites which were suitable for aboriginal occupation or which could have been reached without adequate boats. The gorge walls rise several hundred feet to a rolling sandstone plateau which is so dissected with deep, narrow canyons that it is almost impossible to traverse it. The side canyons entering the upper 15 or 20 miles of Glen Canyon are fairly broad and contain a relative abundance of Pueblo sites, but below this they come in as box canyons which are flooded and filled with quicksand during high water in the Colorado, and which are too narrow through several miles of their lower reaches to have permitted any kind of settlement. Undoubtedly

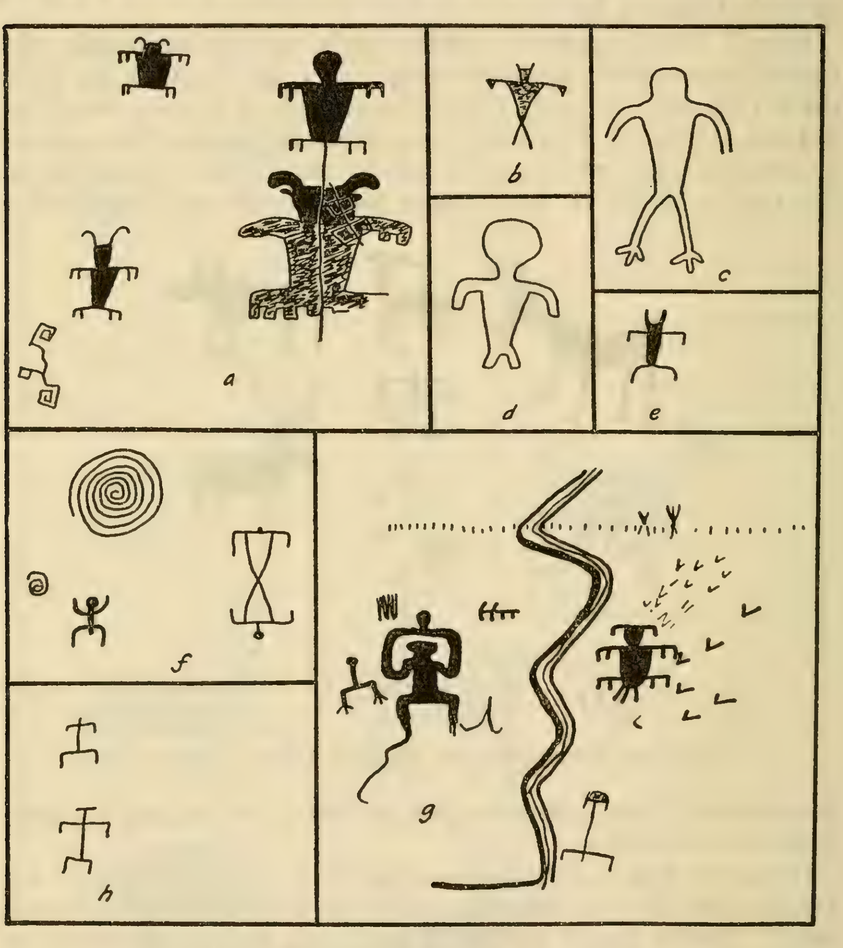

FIGURE 61.—Petroglyphs, site 117, Johnson Canyon.

these have many sites where they broaden out some miles back from the river, but in most instances it proved impossible to explore them.

The trip required 23 days, July 1 to July 23, 1932, 19 days of which were spent on the river. July was chosen, as by that time the water in the Colorado River had passed its height and was said to be best for navigation. The party went via Torrey to the Trachyte ranch at the eastern foot of the Henry Mountains by automobile. From here it was transported the remaining 30 miles down North wash to the river by wagon. Two portable canvas boats proved entirely adequate for river transportation. As the current averaged about 5 miles an hour, only 2 or 3 hours' travel each day covered the necessary distance.

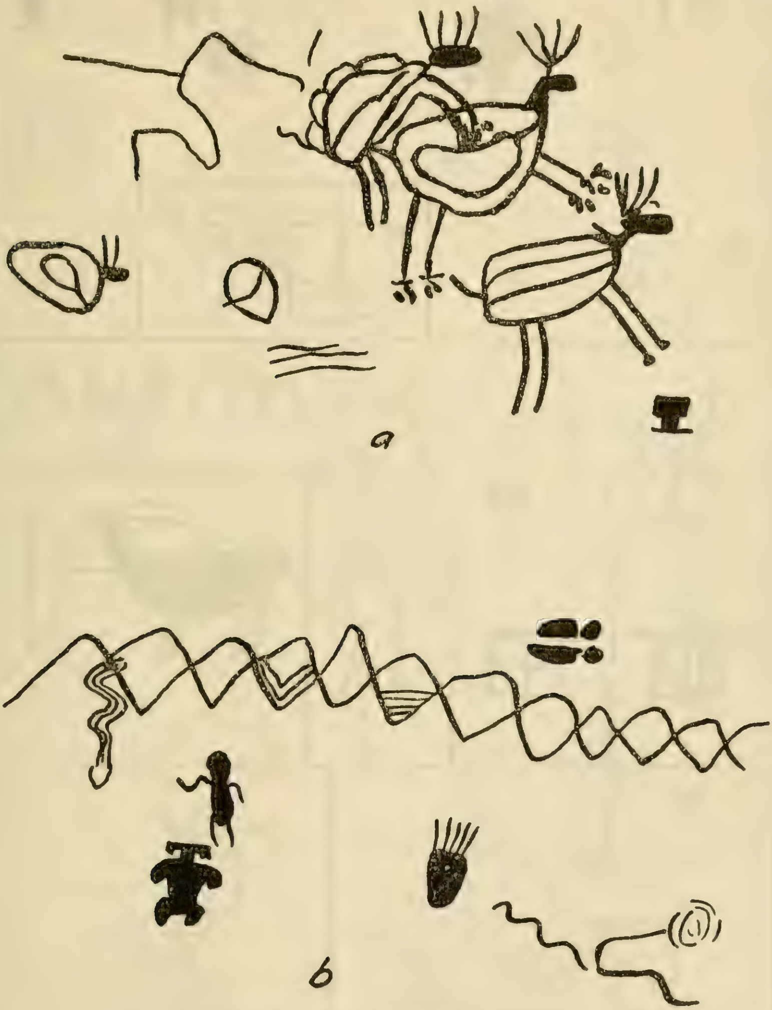

FIGURE 62.—Petroglyphs, site 130, Oak Canyon.

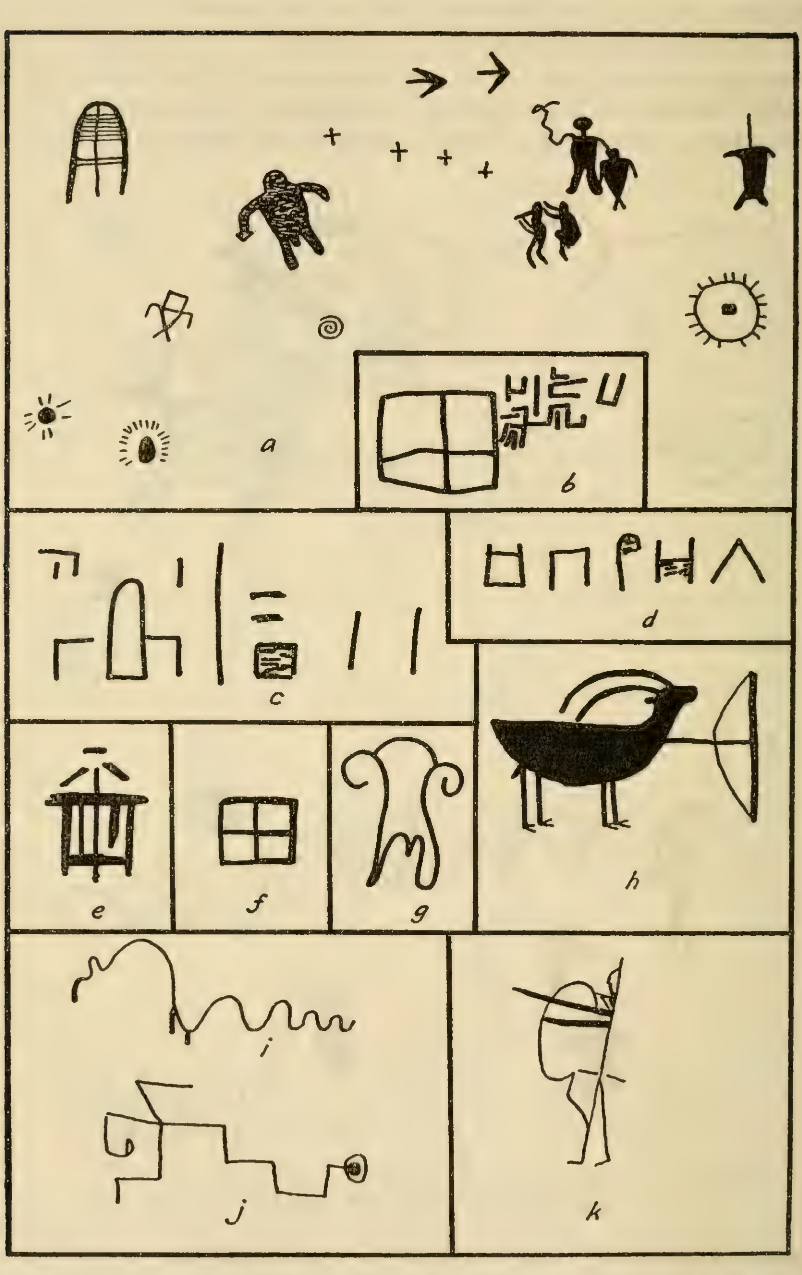

FIGURE 63.—Petroglyphs: *a*, Site 130; *b*, site 132; *c–f*, site 133, Oak Canyon; and *g–k*, site 141, near Clark Canyon.

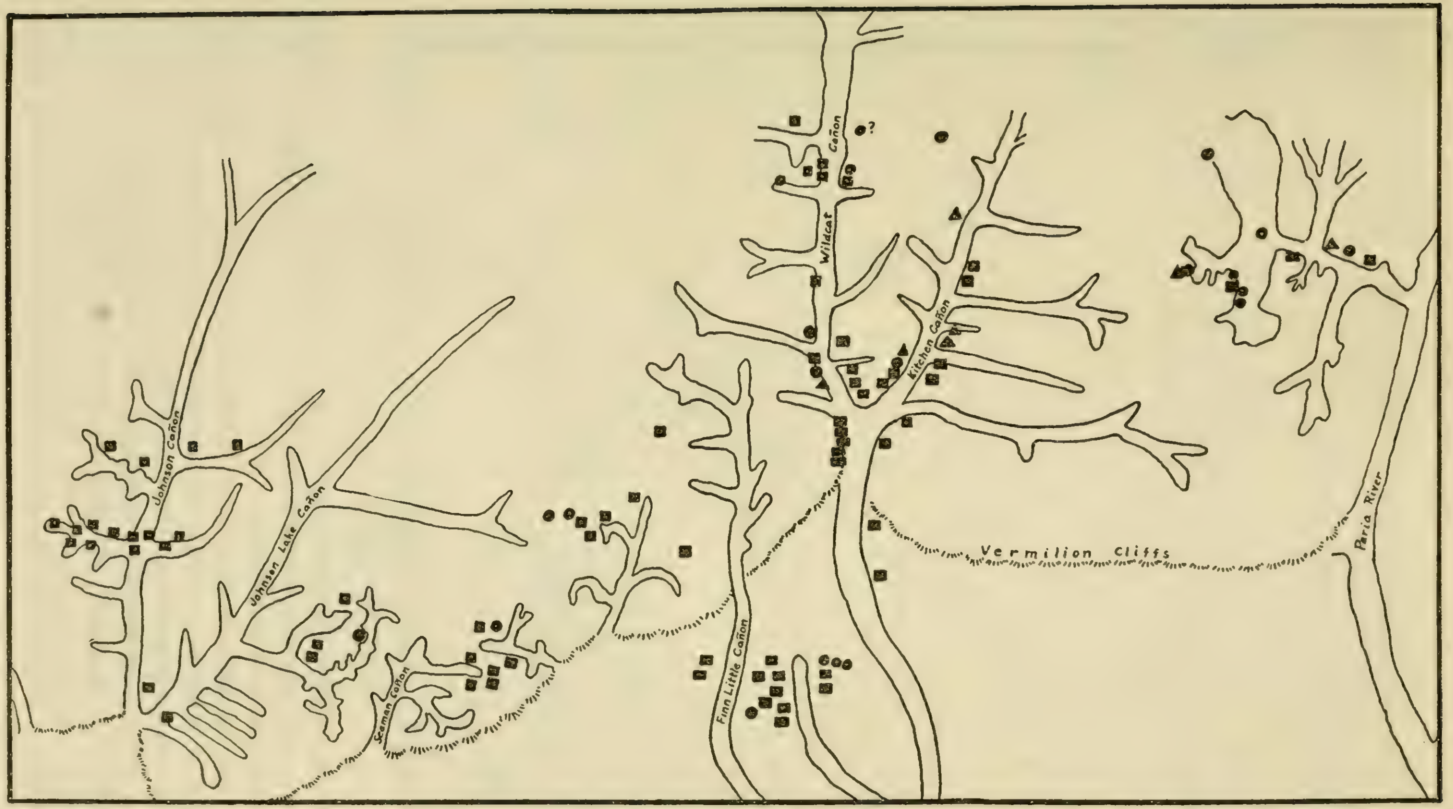
Wildcat Cañon
Kitchen Cañon
Paria River
Vermilion Cliffs
Finn Little Cañon
Johnson Cañon
Johnson Lake Cañon
Seaman Cañon
?

FIGURE 64.—Distribution of sites of different periods in Johnson Canyon-Paria River region: Circle is early (Basket Maker); triangle is transitional; rectangle is late (Pueblo).

SITES VISITED

In North wash, about 10 miles below the wagon road, are a few rock shelters containing traces of occupation in the form of pottery sherds and charcoal but no house remains.

Among the sherds collected, 11996, was one corrugated. Two were bowl sherds, unpolished and unpainted. The remainder were probably from ollas, made of a medium fine paste containing a dark, igneous temper—probably a rock from the Henry Mountains. They are tan in color, and smooth, but unpolished. A few sherds are, however, polished and these are a dark gray with a slightly crackled surface, and greatly resemble the large ollas of western Utah. The vessel forms are not known.

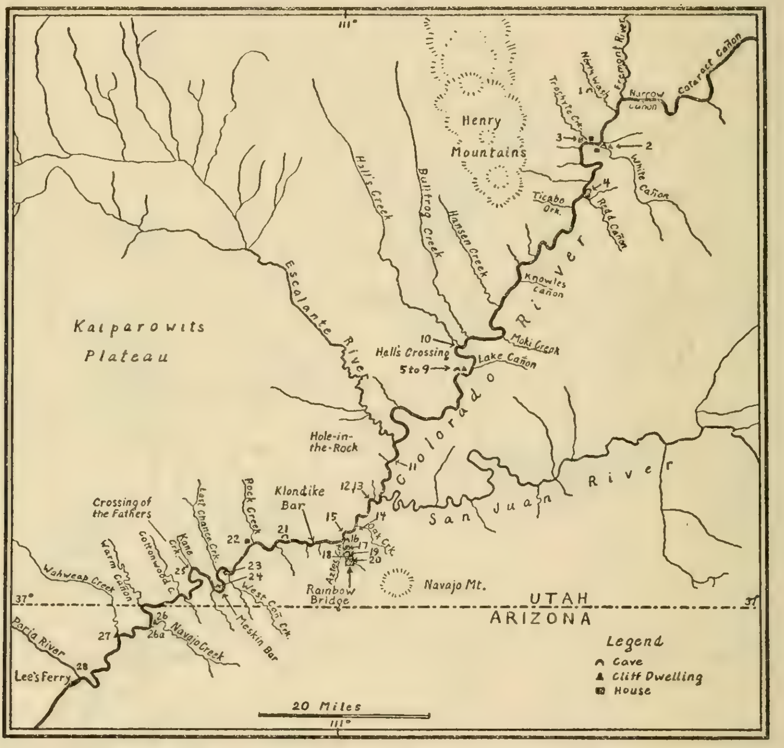
111°
Henry
Mountains
North Wash
Fremont River
Trachyte Crk.
1
Narrow Cañon
Cataract Cañon
3
2
White Cañon
4
Ticabo Crk.
Redd Cañon
Hall's Creek
Bullfrog Creek
Hansen Creek
Escalante River
Knowles Cañon
Moki Creek
10
Hall's Crossing
Lake Cañon
5 to 9
Kaiparowits Plateau
Colorado River
Hole-in-the-Rock
11
12
13
Klondike Bar
Crossing of the Fathers
Last Chance Crk.
Rock Creek
22
21
15
14
Oak Crk.
16
17
18
19
20
Aztec Crk.
Rainbow Bridge
Navajo Mt.
San Juan River
Kane Crk.
Cottonwood C.
Warm Cañon
Wahweap Creek
25
23
24
West Cañ. Crk.
Meskin Bar
Navajo Creek
26
26a
27
28
Paria River
Lee's Ferry
37°
UTAH
ARIZONA
37°
Legend
Cave
Cliff Dwelling
House
20 Miles
111°

FIGURE 65.—Map of Glen Canyon, Colorado River.

From the same locality were: 11998, a fragment of a bone point, perhaps a blunt awl; 11997, fragments of three flint points made with a fair chipping technique; 11999, a number of large, very crudely chipped lumps of beautiful red and yellow streaked jasper. Some of the last may be rejects, others extremely crude scrapers.

Site 1.—A large cave in North wash about 12 miles from the Colorado River, situated on the western side of the canyon, facing southeast. Along the top of the talus which slopes up to the rear wall under the cave's high arch is a series of 12 rooms built of crude masonry. These are either roughly circular or rectangular and in all cases the walls are simply piled rocks. At several places are worn spots on rocks which look as though they might have been formed by grinding axes.

Specimens included only corncobs and animal bone fragments. Not a trace of pottery was found.

On the cliff wall back of the first room is a large, elaborate kachina-like pictograph painted in red with white dots and beside it, a large quadruped (pl. 52, *a*). At other points are two pecked horned quadrupeds and a small, squared-shouldered, phallic female (?).

Below site 1 in North wash, the canyon affords little arable land and there was a corresponding absence of sites. At the mouth of North wash, however, were found small rock-shelters, which yielded a few potsherds like those found higher up in the canyon.

A trip was made on foot to the mouth of the Fremont (Dirty Devil) River but no further traces of aboriginal occupation discovered.

Site 2, White Canyon.—The party proceeded downstream to the mouth of White Canyon which enters the Colorado River from the east. Here are located the most extensive ruins in all of Glen Canyon.

The conspicuous feature is a large house standing about 300 feet above the river on the southern side of the tributary canyon (fig. 66, pl. 49, *a*). The house measures 22 feet 6 inches by 12 feet 6 inches, is of fair masonry, and must have had 2, possibly 3 stories, as the wall still stands at one point 15 feet 9 inches high. At four points along the southern wall, 7 feet 6 inches above the ground, were holes through which had passed the beams supporting the floor of the second story. The masonry is of carefully selected but untrimmed sandstone blocks which are fairly rectangular and are well laid, some parts of the walls being more or less coursed (pl. 49, *e*). Only small amounts of the cementing adobe remain. The average wall thickness is 1 foot 6 inches to 1 foot 7 inches, but this decreases to 1 foot 3 inches a short distance above the second floor.

The house is built on a narrow ledge of flat sandstone which drops away more or less sharply on each side, especially on the river side. That protection was a consideration in choosing this spot is shown by the wall which runs out from the eastern side of the house to the cliff edge. This was 18 inches thick, and although it is now mostly in ruins, it must have served to block thoroughfare along that side of the ridge. The other side, which is narrower with a steeper drop-off down the cliff, could have been defended from the house.

Just under the cliff edge on the eastern side is a small room tucked away under the cliff.

As the house is built on solid rock which could not possibly have been excavated for a kiva, it is probable that the circular enclosure at the end of the ledge, 45 feet north of the house and built on a ledge slightly below it, served as kiva. The wall, 16½ inches thick, built

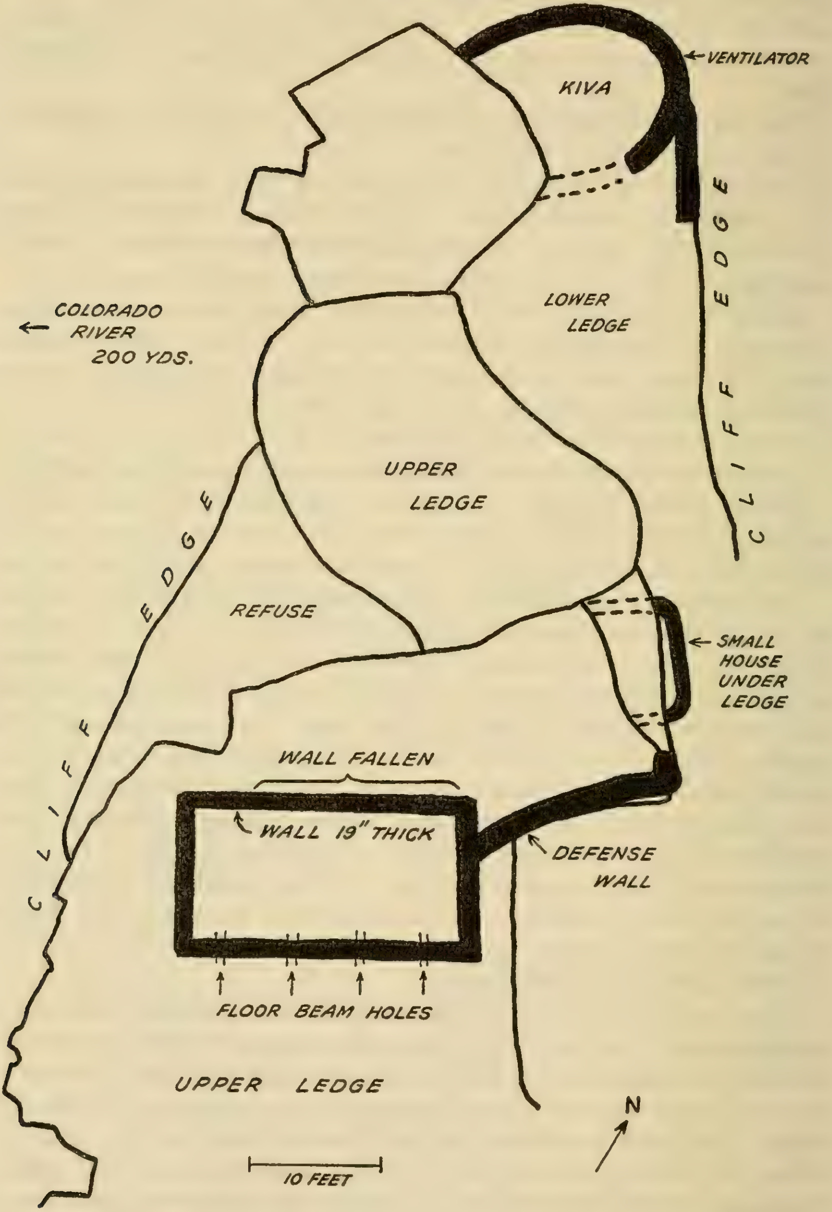
VENTILATOR
KIVA
CLIFF EDGE
LOWER LEDGE
COLORADO RIVER 200 YDS.
UPPER LEDGE
CLIFF EDGE
REFUSE
SMALL HOUSE UNDER LEDGE
WALL FALLEN
WALL 19" THICK
DEFENSE WALL
CLIFF
FLOOR BEAM HOLES
UPPER LEDGE
N
10 FEET

FIGURE 66.—Ground plan of large ruin and kiva, site 2, White Canyon.

against the cliff, forms three-quarters of a circle. Its highest point is now 6 feet. A cleft in the southern side of the wall, one side being neatly squared, may be the remnant of the door. On the eastern side, 12 inches above the floor, is a square opening in the wall 12 inches high and 8 inches wide, which was no doubt a ventilator.

Slightly below the cliff edge of the western side is a foot or more of refuse.

Apparently this house was the center of a fairly large community, for just below it to the south and across the canyon to the north is a series of cliff rooms. Although the latter may, and in some cases very likely do, antedate the large house, it is probable that in the later days of the community the large house was erected as a place of refuge.

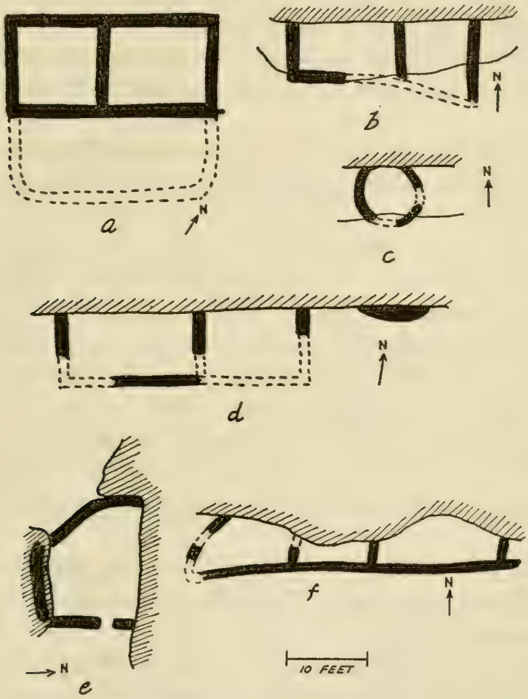

FIGURE 67.—House structures.

a, Plan of ruin at site 3, Trachyte Canyon; *b–f*, houses on the northern cliff of White Canyon, site 2; *b*, house 2; *c*, house 5; *d*, houses 3 and 4; *e*, house 1; *f*, house 7.

Room 1, on the northern side of the canyon, is built between the cliff and a large boulder 11 feet out from it. Masonry walls enclosed the openings, but a door 18 inches wide is left on the eastern side (fig. 67, *e*). On the back wall of the room are two round-bodied, kachinalike petroglyphs faintly pecked. One of these is shown in figure 72, *e*.

Structure 2, like the last, is built under an overhanging ledge. The walls, 15 inches thick, of rather poor masonry, enclose two rooms, one about 13 feet by 6 feet 6 inches, the other, east of this, 8 by 9 feet. At the base of the partition between the two and against the cliff is an opening 19 by 24 inches. There also seems to have been a doorway between the two rooms at the outer end of this partition, and another leading outside from the outer wall of the eastern room (fig. 67, *b*). Room 2 is 50 feet east of room 1.

Structure 3, 150 yards east of last, is enclosed by walls 18 inches thick. There seem to have been two rooms, one about 8 by 16 feet, the other about 8 by 12 feet (fig. 67, *d*).

Structure 4 is a platform of masonry orming a semicircle against the cliff, about 8 feet long and 6 feet deefp, and built 5 feet above the ledge.

Room 5 is just east of the last and is a small, circular granary, 6 feet in diameter and 3 feet 4 inches high, built in under a ledge (fig. 67, *c*).

Room 6 is a natural cave in a large crevice finished into a room by the addition of a few feet of masonry wall. It is 30 feet deep and averages 8 feet in width.

Structure 7, 50 yards east of the last, has an outer wall 10 to 14 inches thick parallel to the cliff, behind which are three rooms, the western one very irregular but approximately 5 by 10 feet, the next 3 by 8 feet, the eastern one 5 by 16 feet. Most of the outer wall had reached up to the ledge or roof above, but has now fallen. Between the first and second rooms is a passage 18 inches wide with a slab, 6 inches thick, as sill.

Other rooms had continued on east of the last, but the ledge, which is several hundred feet above the valley, had partially fallen away, leaving them inaccessible.

On the southern side of the canyon, just south of the large houses and under a ledge overlooking the Colorado River, are several more cliff rooms. The ledge on which they stand has, in several places, been built and levelled up with masonry. The walls seem not to have continued to the roof, but to have enclosed certain areas. Doors, however, lead from one to another (fig. 68; pl. 49, *b*).

Pictographs and petroglyphs.—A characteristic of the Northern Peripheral culture is a remarkable elaboration of anthropomorphic petroglyphs and pictographs. Probably originating in the square-shouldered and comparatively simple Southwestern Basket Maker pictographs, these attained greatest development in northeastern Utah where facial features and ornaments of both head and body are represented in detail. Site 2 at White Canyon is one of the southernmost localities where this style occurs. The White Canyon figures, though differing in some details from many to the north, fall into this general class and are especially related to those on the middle Fremont River (Morss, 1931) and at Moab, farther up the Colorado River.

Along the northern side of White Canyon, between and above the cliff houses, there is a series of round-bodied, anthropomorphic petroglyphs having decorated bodies (figs. 72, 73, *a;* pl. 52, *e*). These are mainly pecked, some of the finer lines, however, being incised or rubbed. Other comparable circles which, however, are less clearly parts of anthropomorphic figures, are pecked on the rocks near the large ruins (fig. 75, *e*). In this group, the anthropomorphic figure was placed over the circle on the left which in turn was over the parallel lines with the dots between. Two groups (figs. 73, *c*, and 74, *f*) show concentric circles and the last also has a circle containing zigzag decoration. Other circles are painted. Plate 52, *d*, shows two complicated circles painted white. Where the paint has eroded from that on the left, rubbed lines appear, though this may be a recent bit of vandalism. Rubbed triangles appear above both figures. A red handprint appears in the center of each circle and two other red handprints, not shown in the plate, are on the cliff to the right. A circle made up of red, white, and yellow-buff lines appears in figure 75, *c*. All of these circles are approximately 3 feet in diameter.

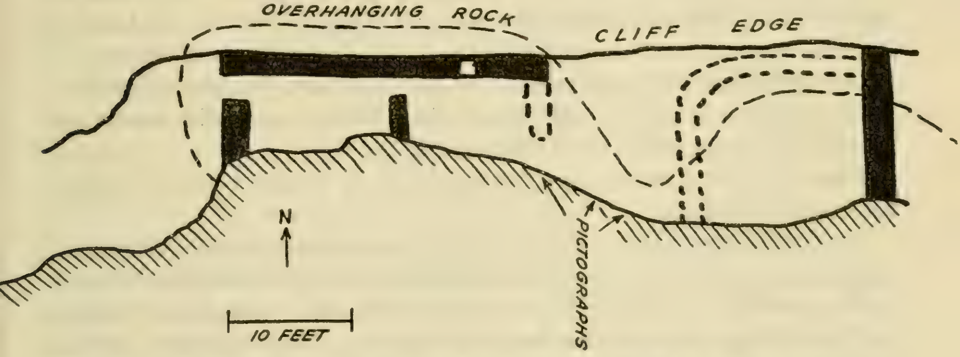

FIGURE 68.—Cliff houses south of the large ruin, site 2, White Canyon.

Although no weapons are clearly depicted in association with these figures, the writer hazards the guess that they represent shields. Two ornamented, rawhide shields were found on the Fremont River where somewhat similar circular petroglyphs appear to represent shields (Morss, 1931). Figure 76 shows several circles on the cliffs at Moab which no doubt belong to the same class of objects.

Another type of anthropomorphic figure is square-shouldered and, though less elaborate than those to the north, clearly of the same general style. The central figure in figure 73, *b*, even has "tear streaks," a device common in the Uintah Basin. Those in figures 73, *c*, and 75, *d*, *e*, are of this style. The three figures in figure 75, *a*, *b*, are painted in white and yellow-buff. That in plate 52, *b*, has the same colors.

In addition to these anthropomorphic figures, several are of the complex curvilinear style common in the Great Basin. Two large groups of such petroglyphs are shown in figure 74, *a*, *e*. Although there is no proof whatever that the anthropomorphic and curvilinear styles were contemporary, it is probable that in western Utah and Nevada the latter, despite its great stylistic difference, was somewhat stimulated by the former. Small anthropomorphic figures, like those in figure 77, on the cliff near the bridge at Moab, occur in Idaho and Nevada beyond the Pueblo area in frequent association with the curvilinear style, and yet seem related to the Northern Peripheral anthropomorphs. It is possible, of course, that chronological differences are involved in these styles of anthropomorphs.

Plate 52, *c*, is a petroglyph, probably made by the Ute or Navaho, to represent a horse.

Specimens from site 2.—Pottery from the northern side of the canyon, 11987, comprises ware which is definitely Mesa Verde in general style and appears to be Pueblo II or early Pueblo III. Corrugated sherds are from large ollas of the San Juan types. Their paste is coarse, quartz tempered, and the coiling rather crude. Coils run 3 to 7 per inch. Eighty-five percent of the corrugated sherds have the coils "crinkled" or pinched at intervals. Some alternate several plain and several crinkled to give a banded effect. For 1 to 2 inches under the rim, the exterior is smoothed. The painted ware has a much finer paste and temper. Bowls have a plain grayish exterior, showing horizontal striations from the smoothing implement. Their interiors have a slip which is slightly grayish white, sometimes crackled, on which are painted designs in black which are Mesa Verde in style. Bowl rims are generally squared, the lip slightly projecting on the outside. Both ollas and bowls average 5 millimeters in thickness. Sherds from painted ollas and jars are like the bowl sherds, but the black design is usually painted on the polished surface which lacks a slip; sometimes, however, a white slip is present. Four sherds have deep, rich red exteriors; one is black-on-red.

The pottery from around the large ruin, 11989, is much like the last. Corrugated ware is slightly better made, somewhat darker, and a little thicker—7 millimeters. Ninety-eight percent of the 48 corrugated sherds are crinkled. Clay and temper in bowls also resemble 11987. The interiors have a slip which varies from paper white to dark gray, like the ware of western Utah. Designs are in a good, solid black with good brushwork, and resemble Mesa Verde ware. A few are Kayenta style. Fine, parallel lines comprise a large portion of the designs. Twelve of fifteen rim sherds have one to five horizontal lines under the rim. Other forms include black and white ollas and ladles with solid handles.

Artifacts of chipped flint are very crude. 11988 is a roughly shaped blade having a more or less diamond-shaped cross section, 2¼ inches long, 1¼ inches thick, ⅞ of an inch wide, of red jasper. 11944, from the large house, is a similar point, 2⅝ inches long, 1¼ inches wide, ¾ of an inch thick, having both ends somewhat rounded. These are common in Glen Canyon and are certainly not projectile points. 11991 is a crudely chipped "pick" of white flint, 3⅝ inches long.

Three small corn cobs were found at the large house, 11995. Two had ten rows of kernels and were 3½ and 2¼ inches long; the third had 12 rows of kernels.

The presence of this village, site 2, is probably to be explained by the several miles of arable land along the river shore and the thoroughfare to the central parts of San Juan County provided by White Canyon.

Site 3, Trachyte Creek.—Trachyte Creek empties into the Colorado River from the west, about 1 mile below White Canyon. Long stretches of tillable land made possible a village, the main ruin of which stands about 100 feet above the river and about 200 yards south of Trachyte creek. It had two main rooms, the western one measuring about 9½ by 10 feet inside, the other 9½ by 12 feet (figure 67, *a*). In front of, i. e., south, of these were possibly two other rooms, but all of the walls are entirely crumbled. It may in part have been two stories. Just south of the ruins is a circular depression about 30 feet in diameter which may have been a kiva or plaza.

Specimens from site 3.—Pottery, 11979, included a corrugated ware much like that at site 2, having a coarse, quartz temper and varying in color from gray to tan. The black-on-white ware was tempered with both chalcedony and a dark, volcanic rock. The clay is generally gray, but 11979–3 is two sherds of red clay. The interior slip on bowls varies from white to gray. Bowls are 4 to 5 millimeters thick. The black designs are slightly inferior in quality of color and brushwork. 11979–5 has the design in brown instead of black. (A specimen from near Blanding, San Juan County, has designs in both this same shade of brown and in black, showing that the brown is not simply a faded black.)

Other ware includes: 11979–1, having a red exterior and a chocolate-brown interior bearing red lines. 11979–2, 3, having plain exteriors and unslipped but polished orange interiors, bearing faint red and black lines. 11979–4, a bowl rim sherd, having a plain gray exterior showing a thin wash of brown and a plain gray interior bearing brown lines.

Stone work includes: 11981–1, a crudely triangular, unnotched point, 1¾ inches long; base width, ⅞ of an inch. 11981–2, fragment of a similar blade. 11981–3, a somewhat leaf-shaped point, 1⅜ inches long. All are gray flint. 11980, a red flint blade 1⅝ inches long, 1⅛ inches wide, ⅝ of an inch thick. The base is somewhat straight, possibly for hafting; the other end is worn diagonally, making a blunt surface ½ of an inch wide; elsewhere the edge is retouched to sharpness.

On the north side of Trachyte Canyon are several low rock shelters facing the river, under one of which was a masonry wall enclosing a low room about 8 feet in diameter. Nearby are several groups of petroglyphs, some suggesting an early—possibly Basket Maker—style, others developed kachinalike anthropomorphs.

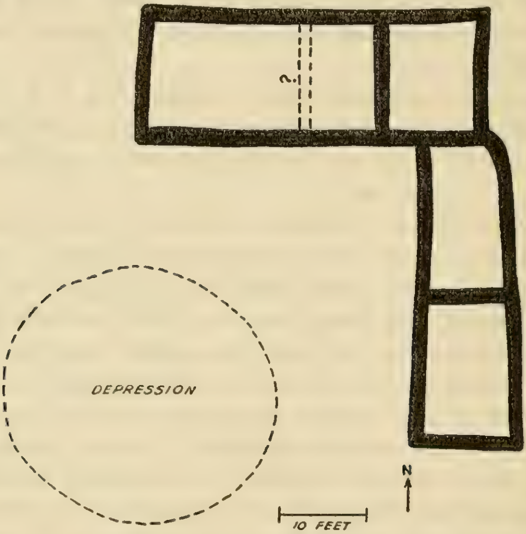

FIGURE 69.—Large ruin at Redd Canyon, site 4.

Site 4, Redd Canyon ("Red Canyon" on most maps).—Extensive flats along the Colorado at the mouth of Redd Canyon afforded possibilities of horticulture. A large ruin stands overlooking the river on the edge of a slightly higher plateau, about ¼ mile north of Redd Creek (pl. 49, *c*, fig. 69). The main wing is 40 feet long, 15 feet 6 inches wide, and runs east and west. It contained two, possibly three rooms, and must have been two stories in height, for the northwest corner still stands 8 feet 1 inch high. The southern wing was apparently added later. It is 12 feet in average width, and 36 feet long, but only stood one story high as indicated by the smaller amount of wall debris. Walls are 18 to 22 inches thick and of masonry similar to that in the large ruin, site 2.

In the angle of the two wings is a circular depression 30 feet in diameter and 2½ feet deep. Although a hastily dug exploratory trench failed to reveal walls or other features of construction, a kiva very likely existed there.

Under the ledge immediately below this ruin were several rooms built against the cliff, facing the river (pl. 51, *a*). There had been two, possibly three rooms, each two stories in height, for one wall still stands 11 feet 2 inches high and has the remains of three beams (probably cottonwood, one of which was collected) of the second floor at a height of 5 feet 6 inches. These walls are 18 to 24 inches thick and of fair masonry.

Specimens from site 4, large ruin.—Pottery, 11982, included: A corrugated ware like that at site 2 but having a temper of coarse quartz, chalcedony, and a dark, igneous rock; painted bowls with an interior slip varying from white to gray (a few had no slip) and decorated with black designs like those at site 2, except for a few sherds which had heavy, black designs resembling Kayenta styles; spherical ollas with short, recurving necks and black-on-white exterior decoration. Chipped flint included: 11984, the square butt of a white flint projectile point or knife.

Specimens from site 4, cliff rooms.—Pottery, 11985, included: A corrugated ware with paste like the last, but vessels which were extremely well made, with very regular coils which overlapped in shingle fashion more than is common, and with alternating bands of plain and crinkled coils, the crinkles being frequently exaggerated by pressing the depressions between them with the fingernail or a stick point (suggesting the "stick impressed" ware from Great Salt Lake); bowls of a fine paste tempered with chalcedony, bearing black interior designs on a finely crackled white slip or on a polished, unslipped gray. The designs are rather faint but in general resemble those at the large ruin.

Below Redd Canyon, the river canyon narrows. There are few stretches of arable river bottom and many of these are rendered inaccessible by the sheer cliffs which rise out of the river above and below them. It is reasonable to suppose that the Pueblo and Basket Maker Indians did not have such means of river transportation as to be able to reach them. No traces of aboriginal occupation could be observed from the boat at those few places which would have been suitable, although a cliff room reached by steps is reported from the vicinity of Bullfrog Creek which enters the Colorado 120 miles upstream from Lee's Ferry and another is stated to be near the river, 4 miles above Hall's Creek or just below the mouth of Bullfrog Creek. The greater part of a day was spent exploring the vicinity of Hall's

Creek (see site 10) but the deep gorges everywhere made it impossible to cover much territory.

Sites 5 to 9.—On the northwest bank of the river about 2 miles below Lake Canyon (111 miles above Lee's Ferry), where a few acres of tillable land parallel the river. Rolling sandstone domes, rising to 1,000 feet above the river, contain many caves, several of which have been occupied.

Site 5.—In the largest of these caves, opposite the middle of a long island. The only trace of occupation is a small levelled space with showings of charcoal and ash. The butt of a large, chipped flint point, 11935, notched slightly at the corners, was found here.

Site 6.—A long cave, well up on the cliff, containing several masonry structures. At its western end is granary A (pl. 49, *d*), built of a circular wall, 7 inches thick, which extends to the rock ceiling, 3 feet 6 inches above the floor in front. It has a door, 1 foot 4 inches wide and 24 inches tall with a stone lintel and sill; the sides of the door are coated with plaster (fig. 70, *c*). The doorway was covered with a neatly trimmed, rectangular stone slab. The cave floor has been levelled up by a retaining wall of crude masonry along the front of the cave. Twenty-nine feet east of granary A is a circular room built partly against the cliff, measuring inside 13 feet 4 inches across and 11 feet 6 inches from the cliff to the outside (fig. 70, *a;* pl. 50, *c*). This is semisubterranean although the walls in the front part extended several feet above the surface of the ground. Exactly opposite the cliff wall at the base of the house wall, is a ventilating opening 12 inches wide and 12 inches tall, the sides of which are formed of vertically set stone slabs (fig. 70, *b*), across which are sticks supporting a horizontal stone slab (fig. 70, *e*). This room was undoubtedly a kiva. A space about 14 feet long by 11 feet wide adjoining the kiva on the east was enclosed by a circular wall made up partly of stone slabs standing 3 feet 6 inches high and partly of masonry (pl. 50, *a*). There seems to have been a door in this about 8 feet out from the cliff wall; the remainder of the wall was made up of perpendicularly set slabs which have fallen. Twenty-two feet east of this room is a short wall running out 8 feet from the cliff, leaving a narrow passage between it and the retaining wall which ends here. Ninety feet east of this passage (telescoped in fig. 70, *a*) at the eastern end of the cave is granary B (pl. 50, *b*). It is semicircular, built against the cliff, and measures 4 by 6 feet. The door measures 18 by 18 inches and is built like that of granary A, except that the stone lintel rests on a horizontal stick (fig. 70, *d*).

Specimens from site 6.—Pottery, 11933, included: 5 corrugated sherds; 1 plain grey sherd having a fine paste and white (chalcedony ?) temper; 1 red sherd having black designs outlined by white. Corn, 11930, included: 5 cobs 2¾ to 4½ inches long having 8, 10, 12, 14, and 16 rows of kernels in pairs. Stone work included: 2 flat metates (fig. 71, *a*, *b*), each 11 inches long and 5 inches wide made of hard, coarse gray sandstone; 2 manos (fig. 71, *c*, *d*), each more or less rectangular in form and cross section, one being slightly grooved down each side for finger grips.

Site 7.—A small cave directly below site 6, having a small rectangular room, 9 feet 6 inches by 6 feet, scooped out of the earth on its steep floor. Ash beds occurred just under the floor surface.

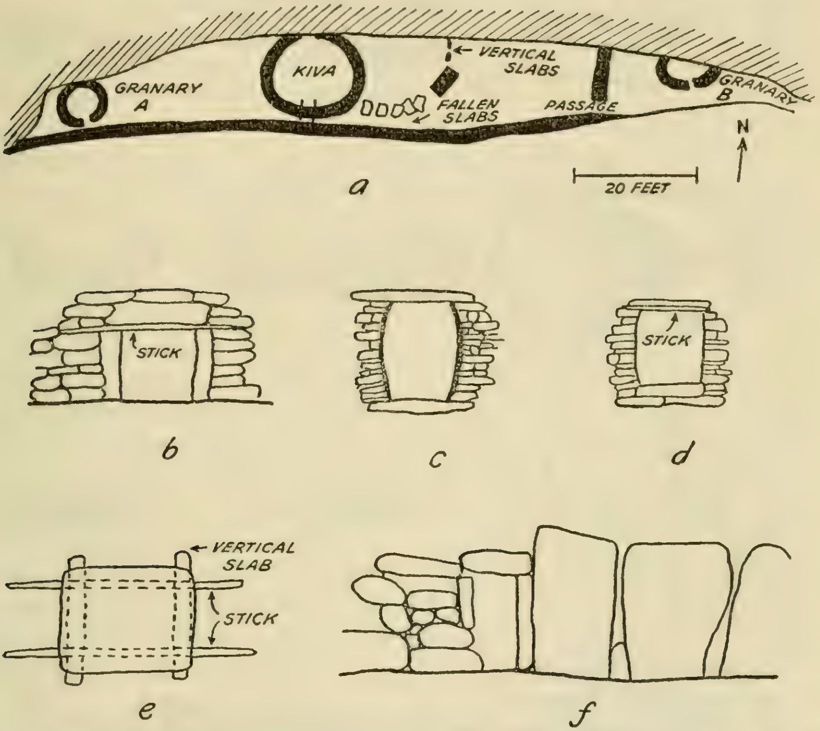

Figure 70.—Details of house structures at site 6 near Lake Canyon and site 22, Rock Creek.

a, Cliff rooms and kiva, site 6; *b*, ventilator in the kiva, site 6, near Lake Canyon; *e*, view from above of construction of ventilator in kiva, site 6; *c*, door to granary *A*, site 6; *d*, door to granary *B*, site 6; *f*, ventilator to kiva, site 22, Rock Creek, showing slab foundation to wall on right.

Specimens from site 7.—Pottery, 11927, includes: Corrugated sherds of a light gray, tempered with fine, dark, igneous rock, 5 millimeters thick (one sherd is tan); bowl sherds of a fine reddish clay having a fine, chalcedony temper, well polished but not slipped, 4 to 5 millimeters thick, and painted with reddish brown designs. Stone 11928, includes: 4 very crudely chipped points like 11994, ranging from 1¾ inches to 2⅝ inches in length, 1¼ inches to 1⅜ inches in width, and one-half to three-quarters of an inch in thickness. They could

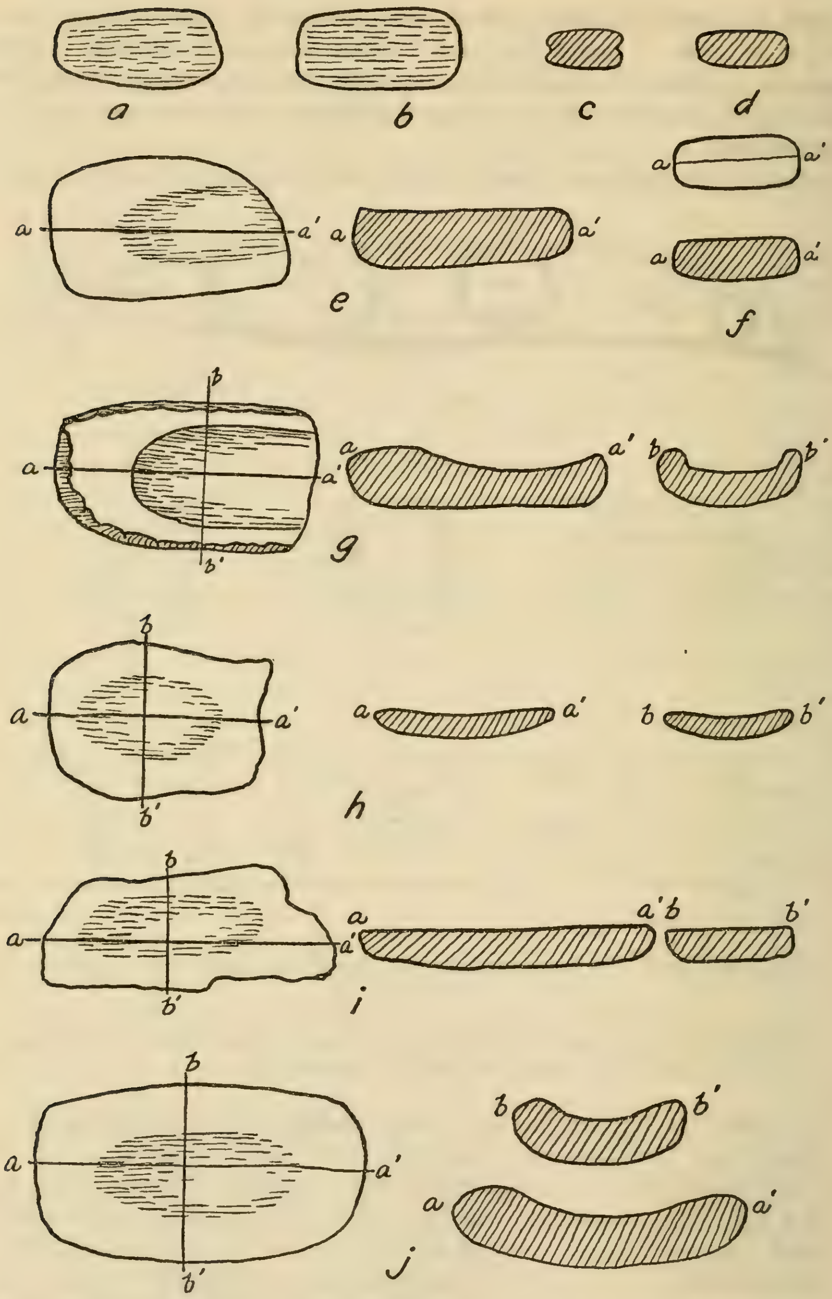

Figure 71.—Metates and manos or mullers, all drawn to same scale (*a* is 11 inches long).

a, *b*, Metates, *c*, *d*, manos, site 6, near Lake Canyon; *e*, metate, *f*, muller, site 9, near Lake Canyon; *g*, metate, site 11, near Escalante River; *h*, *i*, *j*, metates from site 22, near Rock Creek. The parallel hatched figures are cross sections through the metates and mullers.

not have been missile points and they show no wear as knives or scrapers. 11928 also includes 3 tips of what were probably arrow points and one rounded butt of an arrow (?) point.

Site 8.—A cave ½ mile east of the last containing on its western side traces of a very crude slab house 15 feet in diameter. A test pit produced one black-on-red sherd and a layer of grass at a depth of 6 inches, under which were 6 inches of ash. In the eastern part of the cave on an inaccessible balcony 20 feet high, were walls of both horizontally laid stones and vertically set slabs. A corrugated sherd was found just below this balcony.

Site 9.—Another large cave a quarter mile east of the last, containing the trace of a slab house. The pottery, 11936, is a curious ware of very fine, untempered, unbaked clay. Several sherds of the rim of a small, well-made olla with an orifice about 8 inches in diameter, were found here. The pot is too well made to have belonged to the early, unfired ware of the Southwest, and yet the clay and the fact of being unfired makes it totally unlike any known pottery of the Basket Maker or Pueblo peoples. Near the slab house occurred a sherd of corrugated ware. Specimens of stone included: 11938, a thick, crude, white flint point, 1¾ inches long, with an irregular, unnotched base; 11939, the concave base of a very well made, triangular flint point the total length of which must have been about 1¼ inches. 11940 is the fragment of a small corncob. A metate (fig. 71, *e*), was near the house. It was 16 inches long, about 4 inches thick, and had a slight concavity pecked out toward one end of the grinding surface. A muller (fig. 71, *f*) was 8 inches long, 4 inches broad, and 3 inches thick, rectangular in cross section and had been used on opposite faces for grinding. Both were of red sandstone.

Site 10.—A small cave just below the mouth of Hall's Creek. It contained the remains of a flint workshop but no artifacts.

Although caves are numerous along the river below these sites, few were accessible or near land which could have been farmed. Sites had been reported in the vicinity of the Escalante River, but attempts to explore this tributary were frustrated by a torrent brought down by a cloudburst.

Site 11.—"Hole in the Rock," the site of the crossing of Mormon pioneers headed for San Juan County. A perfect "Utah type" metate (fig. 71, *g*), was observed here, but as no other traces of aboriginal occupation were noted and as the location seems quite unsuited for a puebloan people, it is possible that the pioneers who spent some time in this locality had transported the metate from the western part of the State.

Site 12.—On the northern side of the river 2 miles below the mouth of the San Juan River. A huge cave contains traces of the walls of three circular houses, 12 to 18 feet in diameter, and two more or less rectangular houses, about 9 feet square, built partly of vertically set slabs tilting outward and partly of irregular shaped, roughly piled stones (pl. 50, *d*). A rough wall across the top of the ascent to the cave was undoubtedly for defense. Near the circular rooms are three small storage bins built of both vertically set and horizontally laid stone slabs chinked with mud. Bin A (pl. 50, *f*), is 2 feet 6 inches in diameter, 16 inches high. It was built of horizontally laid stones on a large, flat rock, and was roofed with poles, straw, and adobe. Bin B (pl. 50, *e*), is rectangular, enclosed by four vertically set slabs, measures 27 inches by 32 inches, and is 22 inches deep. Bin C is like B, measures 18 inches by 20 inches and is 18 inches deep. All three had evidently been looted in aboriginal times.

Test pits in the houses and other parts of the cave yielded no artifacts except several basketry fragments, 11941. These are coiled, the foundation being flattened rods, one-sixteenth of an inch thick and one-eighth of an inch wide, and a small bundle. The coils are noninterlocking but stitches are sometimes split. There are 6 rods and 9 stitches per linear inch.

Site 13.—On the western bank of the river, about ½ mile south of the last, at the base of the cliff just north of a small, unnamed canyon. Walls of crudely piled stones, 1 to 2 feet high, enclose six different rooms.

Specimens from site 13.—Pottery, 11945, includes: A corrugated ware of coarse clay; black-on-white bowls with typical Kayenta designs, a sherd of which has the remnant of a handle; two sherds of black-on-red ware; one sherd black-on-unslipped white. Stone includes: 11949, fragments of projectile points including one with a notched base; 11943, an elongated pebble of greenstone probably used as a whetstone; 11944, a "throwing stone" of a type common on the Columbia river—a water-worn pebble, chipped so as to leave one end smooth; 11942, a more or less oblong mano, 5¼ inches long, 3½ inches wide, 1⅝ inches thick shaped by pecking and used on opposite faces. 11948 is a corncob fragment.

Site 14.—This site, at the mouth of the first canyon entering the river from the east below Oak Creek, yielded a few sherds, 11950, including: A light gray, thin (4 millimeters thick) corrugated ware and a thin, highly polished but unslipped black-on-white ware reminiscent of Kayenta ware. 11951 is a thick, crudely chipped flint blade, 2¼ inches long, like 11994.

Site 15.—A small cave (pl. 51, *d*), on the west bank about 1 mile above Aztec Creek and about 20 feet up the cliff, containing a rough masonry wall 4 feet high built to retain a levelled floor. Pottery, 11952, found below this included: Four sherds of a coarse, sand-tempered, plain, gray ware; one black-on-white sherd; one handle of the semiloop variety used on Kayenta bowls. 11953 is the rounded butt of a small flint point.

Site 16.—The site comprises several masonry structures in the cliffs at the mouth of Aztec Canyon (leading up to Rainbow Natural Bridge). Three of these are shown in plate 51, *b*. That on the left is 4 feet 6 inches wide and stands 5 feet 2 inches high. Apparently a wall about 18 inches thick had been built on three sides of this and then the core filled in with rock, though this could not be ascertained without tearing down the structure. The central block is 2 feet 8 inches wide and stands 4 feet high. Six inches out from the cliff and 4 feet above the ground is a rectangular hole 7 inches wide and 4 inches high, running through the wall. The wall on the right is 4 feet thick and the outer part stands 6 feet 3 inches. The outer 4 feet 3 inches of this was apparently built as an isolated block and then later connected with the cliff wall. A large, tumbled block of masonry is just to the right of the last. These four structures could scarcely have been walls for rooms, but no other use can be suggested. West of these are three walls running out from the cliff, which probably enclosed three rooms. Just east of them is a large cave, part of the floor of which has been levelled off by building a crude masonry retaining wall. Fragments of what may have been a room evidently have been rearranged by white men.

Specimens had been pretty well removed from this site. Pottery, 11954, included: One corrugated sherd; five sherds of a plain gray ware with a coarse chalcedony and quartz temper; one black-on-red sherd with a finer paste.

A mountain sheep (?) pecked between two of the large masonry structures is one of the few petroglyphs encountered below site 4.

Site 17.—On a small flat on the northern side of Aztec Creek about 1½ miles upstream from the river. Here are two slab cists (pl. 51, *e*, *f*), one 3 feet, the other 2 feet 6 inches in diameter. The first is 2 feet, the second 14 inches deep; both have floors of slabs. Only sand and charcoal were found in them.

Site 18.—In Aztec Canyon just below the mouth of "Bridge Creek" where three or four rooms on a ledge under an overhang are demarked by low, very crude masonry walls. Artifacts comprise only one plain, gray pottery sherd and a few flint chips.

Site 19.—In "Bridge Creek" canyon, ¼ mile east of the last. A wall 2 to 3 feet high had been built up to obtain a level place on a narrow ledge, about 5 feet wide and 15 feet long. Scarcely traceable stone walls divide off three rooms. Across the canyon are two more similar rooms.

Site 20.—A small cave in a canyon north of Rainbow Bridge. Two crude slab houses, about 12 feet in diameter, had been built against the cliff wall. No artifacts were found and the site had been badly dug by pot hunters.

Aztec Canyon evidently had too little arable land to support a population of any size. The few sites there seem to have been hastily erected and only temporarily inhabited.

Site 21.—On the northern shore of the Colorado River about 2 miles below Klondike Bar. A cave contains a rough ring of stones, probably a house, but no artifacts.

From Aztec to Rock Creek there are no other signs of aboriginal occupation except occasional flint chips.

Site 22.—A cave on the western side of the river about ⅛ mile below Rock Creek, at the base of the cliff. A semicircular stone wall built against the cliff makes a room 13 feet long and 9 feet deep. The top of the wall was flush with the ground although originally it probably extended a foot or more higher. Excavation showed that the earliest floor to this room had been 5 feet deep, but that the structure had fallen, the older wall material on the floor had been levelled and a new floor made 18 inches above the other. The base of the western part of the wall was of vertical slabs (among them a large metate). The remainder of the western and all of the eastern wall were built of very crudely laid stone blocks which were untrimmed, uncoursed, and not even coated with plaster inside the room. At the base of the wall, opposite the cliff, was a ventilator demarked by vertical slabs on each side and one on top (fig. 70, *f*). It was 17 inches high, averaged 9 inches in width, and ran out an unknown distance. A bed of charcoal and ash 6 inches deep was on the floor about 2 feet from the ventilator, but no definite fireplace nor deflector had been built. Immediately outside the room was 3 feet of refuse which thinned to 1 foot about 10 feet away. It is probable that the room was originally, at least, semisubterranean.

Specimens from the lower house level, site 22.—Pottery, 11959, includes: Corrugated sherds; bowl sherds of an unslipped light gray ware bearing crudely painted black designs. All pottery is of a coarse, sand-tempered paste. 11957 is several squash seeds. 11956, fragments of gourd or squash rind. 11959, several small corncobs, one having eight rows of kernels. 11958, a hank of human hair. 11960, a fragment of a braid of human hair made up of nine strands, each strand being two-ply and twisted clockwise. 11962, two tips of chipped flint points. 11971, a more or less oval-shaped implement (scraper ?) of chipped gray flint, 2⅛ inches long, 1 inch wide. 11972, two unnotched, more or less squared butts of two chipped points. 11967, bundle of twisted grass.

Specimens from the upper house level, site 22.—Pottery, 11969, includes: A light brownish or grayish corrugated ware of coarse paste and with rather irregular coils, some of which are crinkled; bowls of a light gray clay, painted with narrow irregular lines on a polished but generally unslipped interior. One sherd is untempered, though baked, and may have been a small, unfired pot which was accidentally burned. 12004, ladle of mountain-sheep horn with a somewhat warped bowl, 4¼ inches long, 5¾ inches wide, 2¼ inches deep, and a handle ½ inch in diameter and 5½ inches long, which bends back to form nearly a semicircle. 11973, the end of a sandstone mano, 4⅛ inches wide, ¾ inch thick, with a rounded end; it had been used on opposite faces. 11968, complete corncobs which range from 5⅛ inches to 7 inches in length, with the exception of one which is only 3⅛ inches long; 2 have 12, 2 have 14 rows of kernels. 11970, several gourd fragments. A number of metates were observed but not collected (fig. 71, *h*, *i*, *j*). These and others are similar having a very shallow central basin entirely surrounded by a flat rim 2 to 3 inches wide. Some are shaped by pecking, like figure 71, *j*, which was set into the house wall as one of the foundation stones; others are irregular in outline. In figure 71, *h* is 16 inches long, 2 inches thick; *i* is 21 inches long, 3 inches thick; *j* is about 22 inches long, 4 inches thick and has an unusually deep basin as shown in the cross section. Two other fragments had no definite basin but were used over the entire upper surface. Only that in figure 71, *j*, was found inside the house.

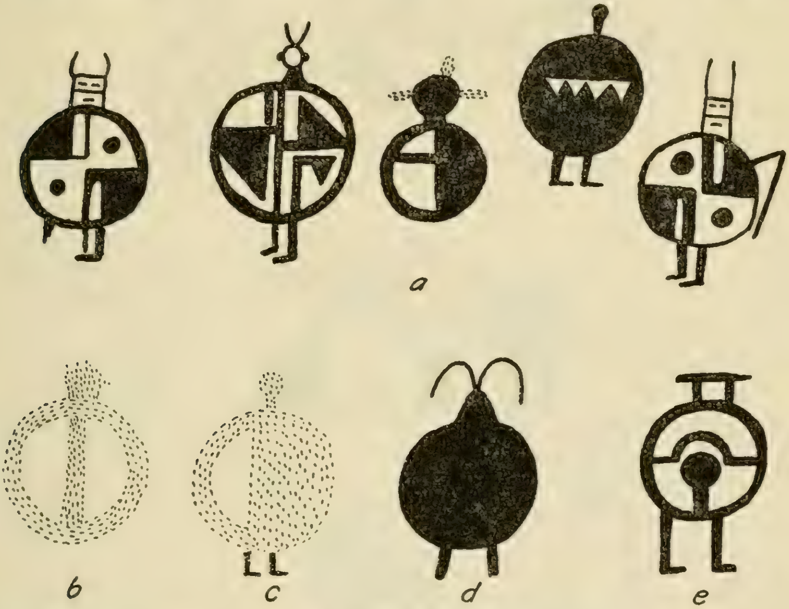

Figure 72.—Petroglyphs at site 2, White Canyon. Each figure is about 3 feet tall.

a, Natural group of 5 figures; *b*, *c*, very faintly pecked.

Site 23.—On the San Juan side of the river. A fragment of a rectilinear petroglyph had been pecked against the cliff back of a long flat just below West Canyon Creek. The location, though seemingly suitable for native occupation, had no other traces of settlement, except a crude petroglyph of a horse, probably of Navaho or Ute origin.

Site 24.—Meskin Bar, 45 miles above Lee's Ferry, has much tillable land, but of several caves suitable for occupation, only one had been used. The floor had been levelled and showed traces of fire.

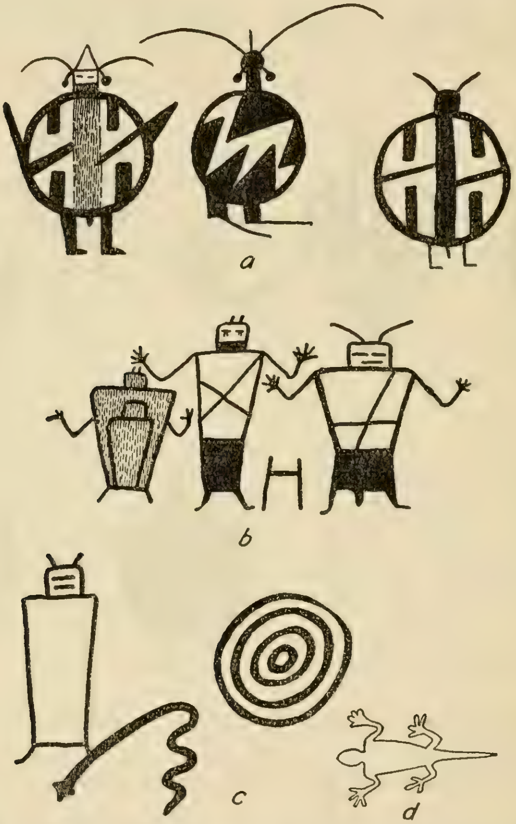

FIGURE 73.—Petroglyphs at site 2, White Canyon.

a, Natural group near house number 2; each figure 3 feet tall. *b*, Group south of large ruin; central figure is 34 inches tall. *c*, Anthropomorphic figure, snake, and circles form group near last; 44 inches tall. *d*, Lizard painted white, about 12 inches long.

Site 25.—At the "Crossing of the Fathers." Only a single sherd of a plain, gray olla was found near Kane Creek.

Site 26.—At the mouth of Navajo Creek which flows in from the east 25 miles above Lee's Ferry. On a ledge in the cliff north of the creek is the remnant of a stone-and-adobe wall granary. Near this was found the rim sherd of a flaring-mouth olla of pinkish clay. It was tempered with exceedingly coarse quartz particles which project through the surface of both sides of the sherd. Sherds from this vicinity, 11963, also included several of very light gray ollas which

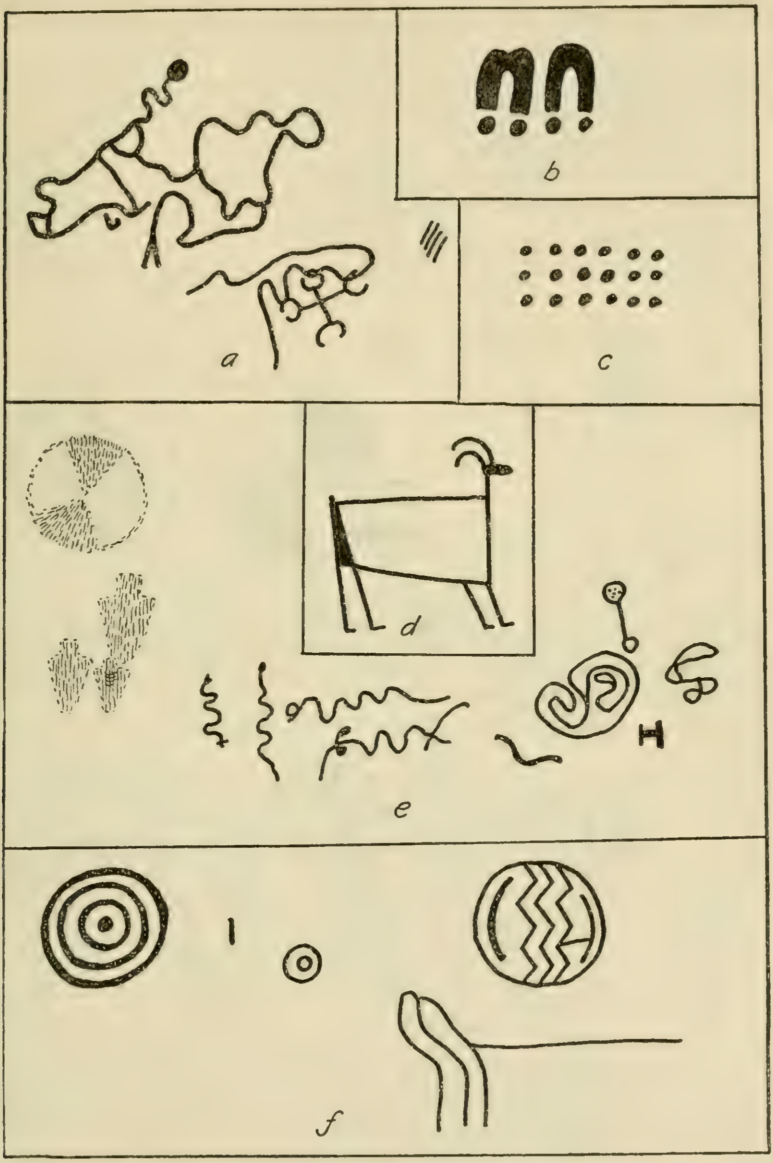

FIGURE 74.—Petroglyphs at site 2, White Canyon.

a, *e*, Curvilinear style.

were in form like corrugated ollas, but none of which were corrugated, and three bowl sherds of finer paste with black designs on a white slip. 11964 is a fragment of a polished "blade" of hard, gray, volcanic rock, 2¼ inches wide, ½ inch thick with rounded edges.

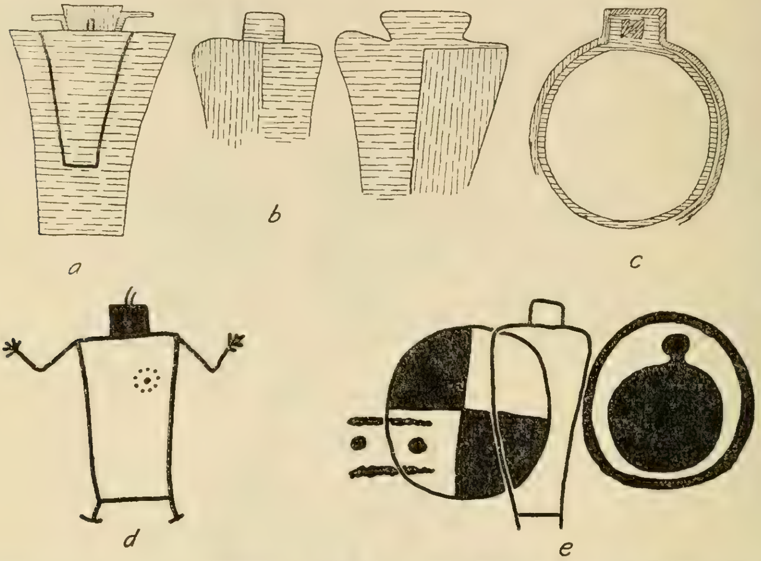

Figure 75.—*a*, *b*, *c*, Pictographs, and *d*, *e*, petroglyphs, at site 2, White Canyon. Horizontal shading, white; vertical shading, yellow; diagonal shading, red. Each figure is about 3 feet tall.

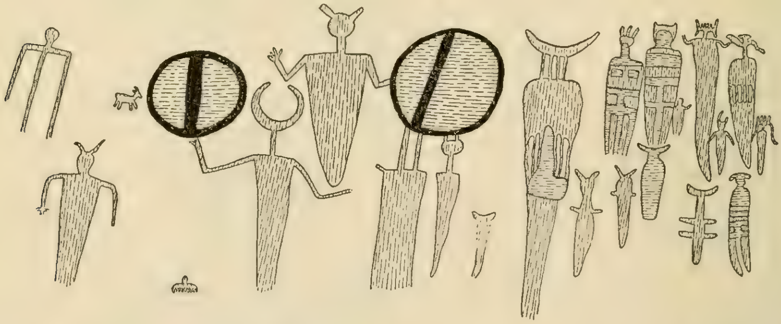

Figure 76.—Pictographs near Colorado River, on highway north of Moab, Utah. Natural group, largest figure being about 7 feet tall. Horizontal shading, white; vertical shading, brown; solid, black.

Sherds, 11965, marked the site of a camp or habitation on the southern side of Navajo Creek. Five are of corrugated ware made of a fine, firm paste; six are small fragments of a black-on-white ware suggesting Kayenta styles; one is a grayish brown-on-red. 11966 is a chipped-flint projectile point, corner-notched, 1¾ inches long and ¾ inch wide. Pottery from this site in the possession of other members of the party includes plain cream colored and orange sherds which evidently are olla fragments.

Site 27.—This site comprises two caves on the western river bank just below the mouth of Wahweap Creek, 17 miles above Lee's Ferry. These show no traces of human occupation, however, except two petroglyphs of anthropomorphic figures with excessively large hands and feet.

Site 28.—Although there is much excellent farm land at the mouth of the Paria River, evidence of aboriginal occupation is suprisingly scant. On the northern side of the Paria River, about ½ of a mile from its mouth, however, is a ruin which has almost disappeared. Its main wing runs east-west and is 50 feet long. A southern wing, 40 feet long, runs off from the western end of this. Pot sherds, 11974, were fairly abundant. Eighty-seven percent of 167 sherds gathered at random are corrugated. Corrugated ware is a brownish gray to light tan; some pieces show a coarse quartz temper, others are finely tempered. It is well made and varies from 2½ to 8 coils per inch. Nearly 90 percent of the sherds are crinkled in some degree. One sherd has, just under the rim, two tiny nobs or handles, ¼ of an inch apart, which project ⅝ of an inch. Of bowl sherds, five have a white interior slip bearing black designs, five have an interior slip ranging from bright orange red to deep, brownish red with black designs. Twelve sherds are plain gray. 11977 is a small, triangular white flint arrow point, ⅞ of an inch long, ¾ of an inch wide across the base.

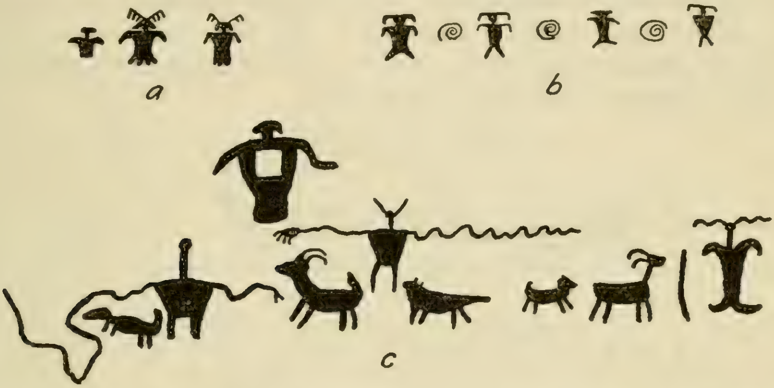

FIGURE 77.—Petroglyphs by highway bridge over Colorado River, near Moab, Utah.

Groups *a* and *b* about 30 feet up cliff; each figure about 10 inches tall. Group *c* on boulder near creek: group is 8 feet broad.

PART 3. CONCLUSIONS

The Johnson Canyon and Paria River region.—Summarizing the data in the accompanying table, it is found that of 36 sites having only slab structures, 11 have early pottery (Paria gray and Basket Maker black-on-gray), 4 have transitional or overlapping pottery types, and 9 (and possibly 2 others) have late pottery types. Some of the last sites could belong to house groups of the late period which were not located or could mark minor encampments. Judging, however, by sites 39, 41, 42, and 72, which seem clearly to be slab-house villages and yet contain Johnson gray-tan, Johnson corrugated, and Tusayan black-on-white pottery, advanced ceramic styles reached the region before pueblo masonry architecture was used. Of 34 sites having masonry architecture, 31 had definitely late pottery (black-on-red, corrugated, Tusayan black-on-white, and Johnson gray-tan), although occasional early wares or features of early wares, especially design elements, survived into this phase.

TABLE 6.—*Cultural contents of sites*[1]

Site	Pottery	Masonry house cluster	Masonry cliff house	Slab structures	Metate type	Petroglyphs	Projectile type	Remarks
1	O	O	O	O	O	×	--------	
2	O	O	O	×	A	--------	--------	Transitional house.
3	E	O	O	O	--------	--------	--------	
4	L	O	×	O	--------	×	--------	
5	E	O	O	×	--------	--------	--------	
6	E	O	O	×	--------	--------	--------	
7	L	O	O	O	--------	×	--------	
8	O	O	O	(?)	O	O	--------	Crude stone house, cave.
9	T	×	O	O	O	O	--------	
10	E	O	O	O	A	--------	--------	"Hoes."
11	O	O	×	O	O	O	--------	Cave.
12	O	O	O	O	--------	--------	--------	Do.
13	E	O	O	O	--------	--------	--------	"Hoes."
14	×	O	O	O	--------	--------	--------	Do.
15	E	O	O	O	--------	--------	--------	Cave.
16	×	O	O	O	--------	--------	--------	
17	E(?)	O	O	O	--------	--------	--------	
18	L	×	O	O	--------	--------	--------	
19	E(?)	O	O	O	--------	--------	--------	
20	L	O	×	O	--------	--------	--------	Do.
21	E	O	O	O	--------	--------	A	
22	O	O	O	O	--------	--------	--------	Rock shelter.
23	L	O	O	O	--------	--------	B	
24	E	O	O	O	--------	--------	--------	
25	L	×	O	×	--------	--------	B	
26	E	O	O	×	--------	--------	--------	
27	O	O	×	O	--------	--------	A	
28	E	O	O	O	--------	--------	--------	
29	O	O	O	O	--------	×	--------	
30	L	O	O	O	--------	--------	--------	Cave.
31	L	O	×	O	--------	--------	--------	Cave, granary.
32	L	O	O	O	--------	--------	A	Cave.

---

[1] T, transitional pottery; ×, element present; E, early pottery; L, late pottery; A, B, metate types described on pp. 299–309; O, element absent.

TABLE 6.—*Cultural content of sites*—Continued

Site	Pottery	Masonry house cluster	Masonry cliff house	Slab structures	Metate type	Petroglyphs	Projectile type	Remarks
33	O	O	O	O	--------	--------	--------	
34	E	O	O	O	--------	--------	--------	
35	O	O	O	O	A	--------	--------	
36	T-L	O	O	O	--------	--------	--------	Do.
37	L	O	×	×	--------	--------	--------	Do.
38	O	O	O	O	--------	--------	--------	Rock shelter.
39	L	O	O	×	--------	--------	--------	
40	O	O	O	O	--------	×	--------	
41	T-L	O	O	×	--------	--------	A	
42	T-L	O	O	×	A	--------	--------	
43	O	O	O	O	--------	--------	--------	Flint workshop.
44	L	O	O	(?)	--------	--------	--------	
45	L	O	O	O	B	--------	--------	
46	L	O	O	O	--------	--------	--------	
47	L	O	O	O	--------	--------	--------	
48	L	×	O	×	--------	--------	B	
49	L(?)	O	O	×	--------	--------	B	
50	L	O	O	O	A	--------	--------	
51	E	O	O	×	--------	--------	--------	
52	T	O	O	×	--------	--------	--------	
53	L	×	O	×	A	--------	--------	
54	L	×(?)	O	×	--------	--------	--------	
55	L	O	O	O	--------	--------	--------	
56	L	O	O	×	--------	--------	--------	
57	L	O	O	O	--------	--------	--------	
58	T	O	O	×	A	--------	--------	
59	L	O	O	×	--------	--------	--------	
60	L	×	O	×	--------	--------	--------	
61	L	O	O	×	--------	--------	--------	
62	L	O	O	O	A	--------	--------	
63	L	O	O	O	--------	--------	--------	
64	L	O	O	O	--------	--------	A, B	
65	L	O	O	O	--------	--------	B	Sevier black-on gray associated.
66	(?)	O	O	O	--------	--------	--------	Flint workshop.
67	E	O	O	O	--------	--------	--------	Scattered sherds and flints.
68	E	O	O	O	--------	--------	--------	Do.
69	E	O	O	O	--------	--------	--------	Do.
70	E	O	O	O	--------	--------	--------	Do.
71	E	O	O	×	--------	--------	A	
72	L	×	O	O	--------	--------	A, B	
73	L	×	O	×	B	--------	A	
74	(?)	×	O	O	--------	--------	--------	
75	(?)	×	O	×	--------	--------	--------	
76	L	×	O	O	--------	--------	B	
77	E	O	O	×	--------	--------	--------	
78	L	×	O	O	--------	--------	--------	
79	L	O	O	O	B	--------	--------	
80	L	×	O	O	--------	--------	A, B	
81	T (?)	×	O	×	--------	--------	--------	
82	L	×	O	×	--------	--------	--------	
83	T-L(?)	×	O	×	--------	--------	--------	
84	O	×	O	×	--------	--------	--------	
85	L	×	O	O	--------	--------	--------	
86	E	O	O	×	--------	--------	--------	
87	E	O	O	×	--------	--------	--------	
88	×	O	O	O	--------	--------	--------	
89	×	O	O	×	--------	--------	--------	
90	E (?)	O	O	×	--------	--------	--------	
91	×	O	O	O	--------	--------	--------	Cave.
92	L (?)	O	O	O	--------	--------	--------	

TABLE 6.—*Cultural content of sites*—Continued

Site	Pottery	Masonry house cluster	Masonry cliff house	Slab structures	Metate type	Petroglyphs	Projectile type	Remarks
93	L (?)	O	O	O	--------	--------	--------	
94	L	×	O	O	--------	--------	--------	
95	L	×	O	O	--------	--------	--------	
96	O	×	O	O	--------	--------	--------	Slab and masonry.
97	O	×	O	O	--------	--------	--------	Do.
98	L	×	O	O	--------	--------	--------	
99	L	O	O	O	A	--------	--------	
100	E (?)	O	O	×	A	--------	--------	
101	×	O	O	×	--------	--------	--------	
102	L	(?)	O	×	--------	--------	--------	
103	L	O	O	×	--------	--------	--------	
104	×	(?)	--------	--------	--------	--------	--------	Scattered sites.
105	×	(?)	--------	--------	--------	--------	--------	Do.
106	×	(?)	--------	--------	--------	--------	--------	Do.
107	×	(?)	--------	--------	--------	--------	--------	Do.
108	E (?)	O	O	×	--------	--------	--------	
109	×	O	O	×	A	--------	--------	
110	L	×	O	O	--------	--------	--------	
111	L	O	×	O	--------	×	--------	Granaries ?: special metate.
112	E (?)	O	O	O	--------	--------	--------	
113	L	--------	--------	--------	--------	--------	--------	
114	×	×	O	O	--------	O	--------	
115	L	×	O	×	--------	--------	--------	Burial in cist.
116	E	×	O	×	--------	--------	--------	
117	O	O	O	O	--------	×	--------	
118	O	O	O	×	--------	--------	--------	
119	L	×	O	×	A	--------	--------	Also burials.
120	L	O	O	×	--------	--------	--------	
121	O	O	O	O	--------	×	--------	
122	L	×	O	O	--------	--------	--------	
123	L	×	O	O	--------	--------	--------	
124	L	O	O	×	--------	--------	A	
125	L	O	O	O	--------	--------	A	
126	L	O	O	×	--------	--------	--------	
127	O	O	O	O	B	--------	--------	
128	O	O	O	O	--------	×	--------	
129	×	×	O	O	--------	--------	--------	
130	O	O	O	O	--------	×	--------	
131	L	O	×	O	--------	×	--------	
132	O	O	×	O	--------	×	--------	
133	O	O	O	O	--------	×	--------	
134	×	O	O	O	--------	O	--------	
135	×	O	O	O	--------	O	--------	
136	×	O	O	O	--------	O	--------	
137	L	×	O	O	--------	--------	--------	
138	O	×	O	O	--------	--------	--------	
139	E (?)	O	O	O	--------	--------	--------	Rock shelter.
140	L	O	O	×	--------	--------	--------	
141	O	O	O	O	--------	×	--------	
142	L	O	×	O	--------	--------	--------	Basket Maker metate.

The cultures encountered in the Johnson Canyon and Paria River region fall into the following chronological order:

1. *Basket Maker.*—Although there is little evidence of this in the Johnson Canyon and Paria River region, it is well represented in DuPont Cave (Nusbaum, 1922) and in other caves, dug by ranchers in the vicinity of Kanab.

2. Basket Maker slab-house culture (*Derived Basket Maker*).—This is characterized by slab houses and cists, arranged in small clusters and by "early" pottery—Basket Maker black-on-gray and Paria gray.

3. A transitional period of uncertain nature.—Late pottery types are appearing. Masonry is added to slab houses and perhaps to pit houses as at site 2.

4. Pueblo culture.—Houses are of coursed masonry, in caves or on knolls near washes. The most standardized and probably latest arrangement is half a dozen rooms forming a semicircle on the northern side of a kiva (?). No extensive amalgamation of these "units" into larger villages is observed. Slab cists and possibly houses accompany these clusters. No doubt slabs are occasionally used in masonry houses. Pottery wares are Tusayan (Virgin) black-on-white, Tusayan black-on-red, Johnson gray-tan, Johnson corrugated, with occasional intrusions of outside wares, such as North Creek black-on-white from the west (?), Sevier black-on-gray from the north. The metate is rectangular, having either an oval or, more commonly and perhaps later, a rectangular grinding basin.

Although Hayden (1930) claims Pueblo III pottery in southern Nevada, the writer knows of no trait in the Johnson Canyon–Paria River region which can be attributed to influence from Pueblo III of the San Juan cultures. In fact, he regards skeptically the occurrence of any such influence farther west. This does not, of course, provide proof that the latest cultures of these regions may not have been in part contemporary with the San Juan Pueblo III. It does, however, demonstrate that the latter had become less liberal in its contributions to neighboring areas by this time.

The number, size, and distribution of the various sites indicate appreciable ecological changes from period to period. Of 109 sites which can be dated by pottery or architecture or by both, 11 have slab structures and early wares, 14 early wares only and 4 slab structures only (the last, may, of course, be later), a total of 29 Basket Maker sites. Thirty-one have masonry structures and late wares, 10 masonry structures only, and 21 late pottery only, a total of 62. Add to this 11 slab sites with late pottery and the total is 73 late sites, or more than twice as many Pueblo as Basket Maker sites. The late sites, moreover, are generally larger than the early ones. Very rough calculations of floor space of all structures combined at slab-structure site 41, probably the largest of its kind, give 285 square feet, and at site 39, also unusually large, 234 square feet. The masonry house site 82, perhaps the largest, had a total of 665 square feet in rooms and cists, site 48 had 643 square feet, site 53 had 401 square feet, site 72 had 379 square feet, and many others are of equal size. Althrough later quarters may have been relatively more luxurious, a marked population increase is indicated, a doubling at least. This, no doubt, was coupled with increasing importance of horticulture. Pueblo migrations may also have contributed to the increase; only skeletal material can settle this.

The distribution of early and late sites is shown in figure 64. A slightly greater proportion of Basket Maker sites in the northern and western portions of the area may correlate with greater importance of hunting to the culture. This possibility could perhaps be checked by a study of the distribution of game in the region and the mammalian remains in the sites.

Puebloan sites are naturally found in or near fertile canyon bottoms, but there is a surprising number of masonry houses variously situated on mesas, remote from present water sources. There were, in fact, few localities, however uninviting, that did not yield sherds, flints, and other evidence of human occupation.

Glen Canyon.—Although archeological evidence from this section of the Colorado River is very scant, a few positive conclusions appear permissible.

First, the river canyon and the neighboring terrain were too rugged and too limited in farming possibilities to attract any great number of agricultural people. Of nonagricultural people, there is no certain evidence. The Ute are known to have inhabited it very sparsely in recent centuries. Evidently its population was always sparse.

Second, most of the region cannot be definitely assigned to any geographical divisions of the Anasazi area. Comparison of these sites with those of other sections is somewhat handicapped by the scarcity of minor antiquities. It seems certain, however, that this region did not provide a source for the typical Northern Peripheral culture which was strongly implanted on the Fremont River (Morss, 1931) only a short distance to the north. Rather, it was a cultural depression into which influence had trickled from various directions. Some petroglyphs, especially at site 1, are definitely related to those of the Northern Periphery. Ceramic styles, however, affiliate it with both Mesa Verde and Kayenta more than with the north and west. Architecture also is San Juan and shows some influence even of the Great Period Pueblo which found here its northern limit.

In short, it appears mainly to have been a kind of no-man's land which had been very slightly settled by outposts from both Mesa Verde and Kayenta and which had come into contact with the Northern Periphery but had not strongly influenced it. Farther south, however, toward the Arizona border, the sites increasingly resemble those of the Kayenta district and of the Johnson Canyon–Paria River district, to which they are geographically contiguous.

Summary.—It had been hoped that these surveys would throw some light on one of the outstanding problems of the Northern Periphery—the problem of where the Basket Maker and Pueblo cultures blended prior to their diffusion to the north. This survey seems to eliminate the regions under consideration.

The region east of Kanab in southern Utah is not related to the Northern Periphery. It is rather a part, both geographically and culturally, of the Lower Colorado Plateau, that is, the area of southwestern Utah and northwestern Arizona. Whereas the Northern Periphery had no Basket Maker as distinct from Pueblo culture, development on the Lower Colorado Plateau followed closely the San Juan sequence, showing strong Tusayan influence which is most recognizable in ceramics. Moreover, the cultural inventory of southern Utah does not correspond with that of the Northern Periphery, indicating that there was little contact between the two areas. The former lacked the "Utah type" metate, elaborate anthropomorphic clay figurines, and petroglyphs, stone balls, "Fremont moccasins," gaming (?) bones, and such ceramic features as stuck-on decoration, all typical of the north. The Northern Periphery, on the other hand, lacked such local features as ceramic styles, the turkey, developed kivas, and elaborate textiles.

Only two elements indicate a possible connection between the north and south: Sevier black-on-gray pottery and the jacal pit lodge. The former, which is scarce at Northern Peripheral sites in eastern Utah but very abundant in western Utah, may have originated in this area where, though it is not abundant, it seems to have been a trifle earlier than in the north. The jacal type pit lodge of the extreme north had been assumed to have come from the jacal type of the Early Pueblo culture of southwestern Colorado. It is conceivable, though unlikely, that it was an independent adaptation of shallow slab houses. Such slab houses are common in southern Utah and, though little is known about house types throughout eastern Utah, they appear again in Nine Mile Canyon in northeastern Utah (Gillin, 1938).

Present evidence also eliminates eastern Utah as the source of the Northern Peripheral culture. Like southern Utah, the region south of the Fremont River in eastern Utah lacks the specific northern traits, with a few minor exceptions, and is related instead to the San Juan area. It if contributed at all to the north, it was in passing on masonry architecture which marks the second phase of the Northern Peripheral culture.

It appears at present that the source of the original Northern Peripheral culture should be sought in western Colorado or extreme eastern Utah, a region which is virtually unknown archeologically.

It should also be added that to date central and southern Utah has not yielded a trace of the Promontory culture. This is a hunting culture, using the bow and making a distinctive pottery and is found only in the Salt Lake basin. Negative evidence from other parts of Utah supports the belief based on the nature of this culture that it is of northern origin.

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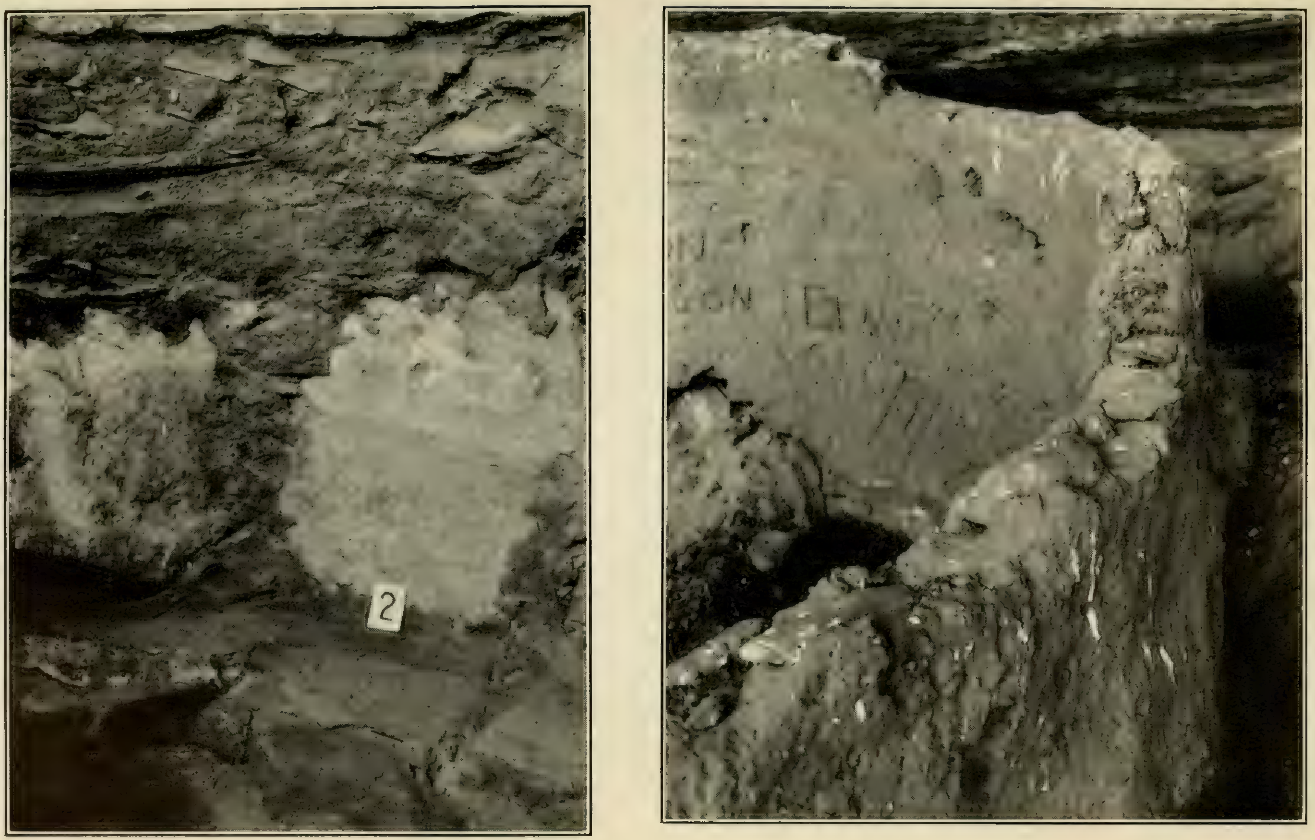
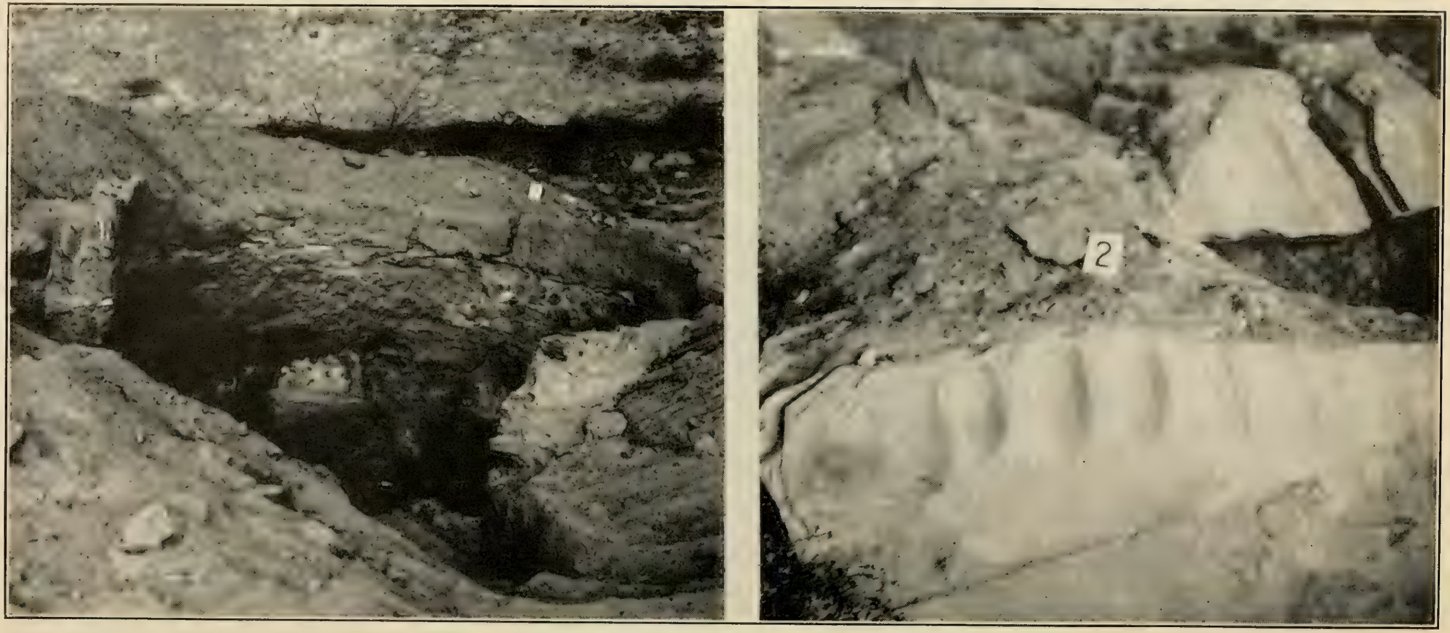


SITE 2, MOLLY'S NIPPLE CANYON.

a, Slab-lined floor and walls of pit house A, masonry walls showing above.

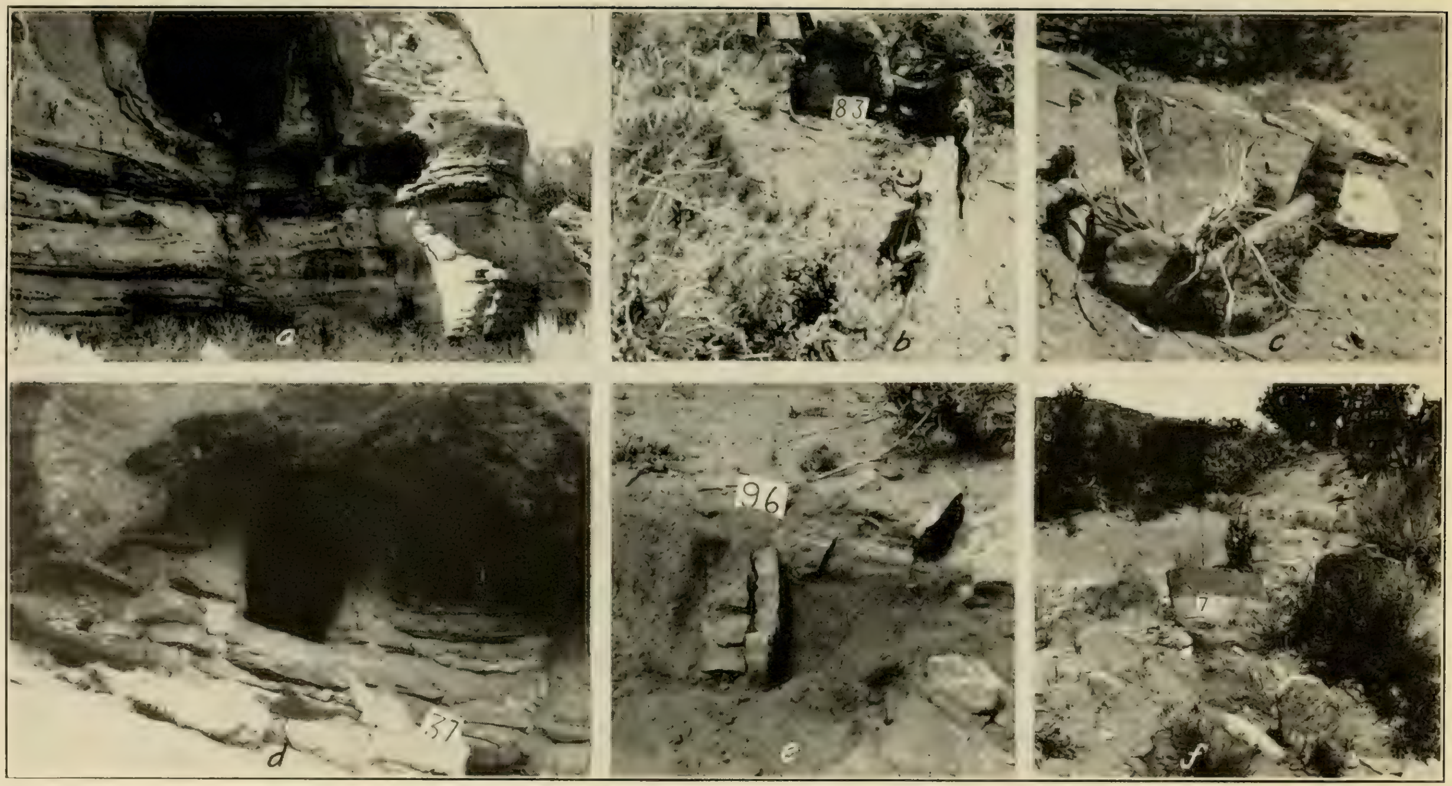
b, Section of house B wall.



SITE 2, MOLLY'S NIPPLE CANYON.

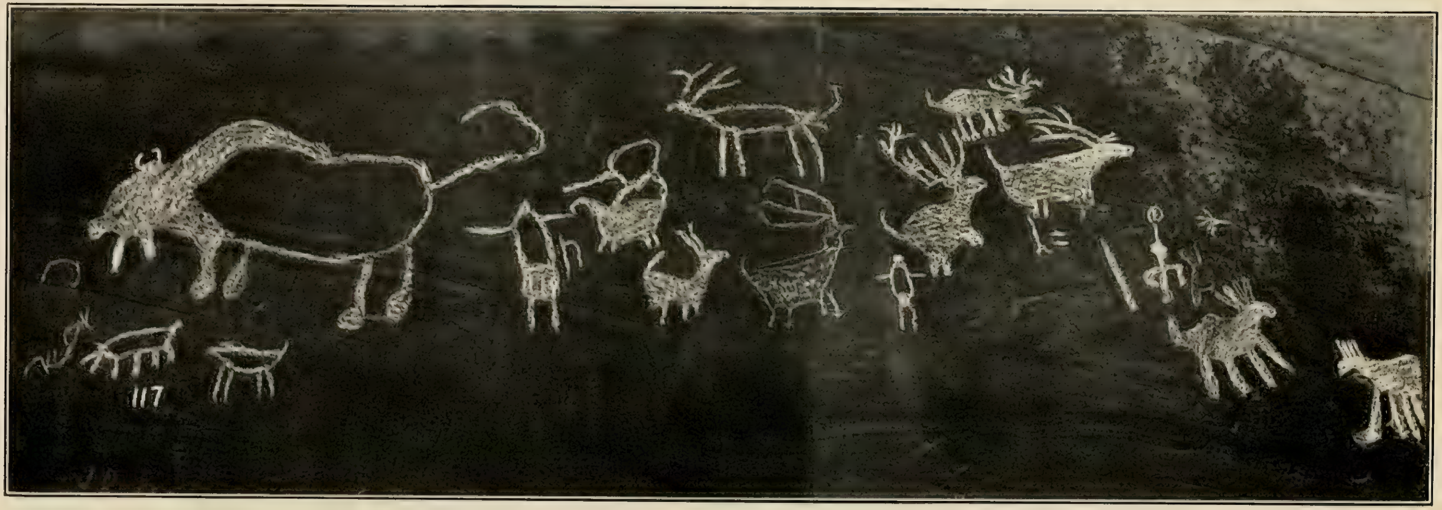
a, House A, doorway in foreground.

b, Rubbed grooves in rock.

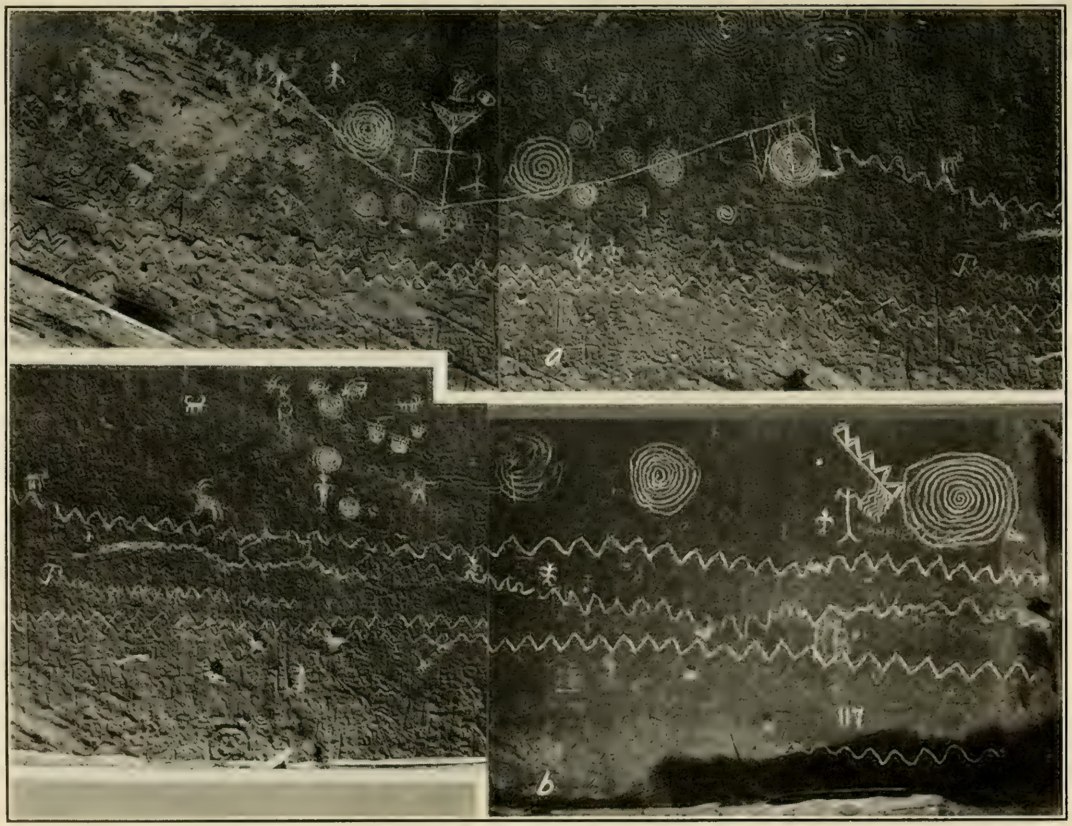


MASONRY CLIFF HOUSES AND SLAB STRUCTURES.

a, Masonry cliff house, site 18, Nipple Spring. *b*, Slab structure, site 83, Clark Canyon. *c*, Typical slab cist. *d*, Masonry cliff house, site 37, Kitchen Canyon. *e*, Masonry wall surrounding slab structure, site 96, Seaman Canyon. *f*, Slab circle, site 71, near Wildcat Canyon.

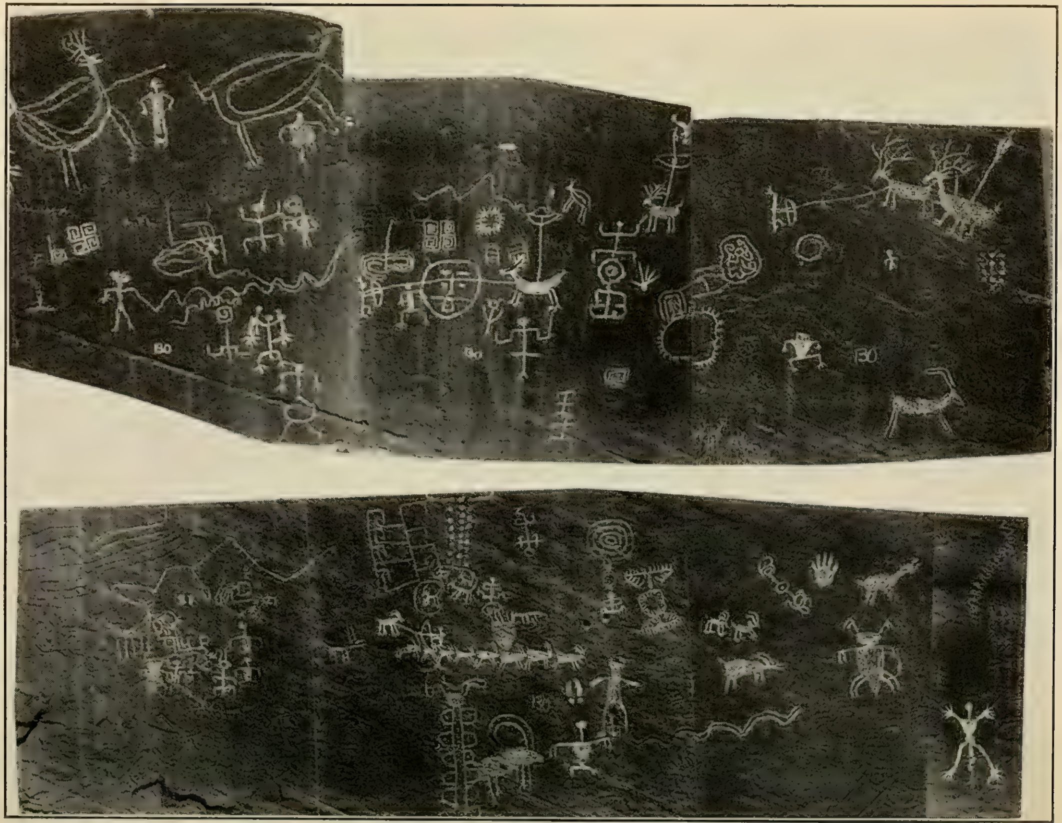


Petroglyphs at Site 117, Johnson Canyon, Chalked.



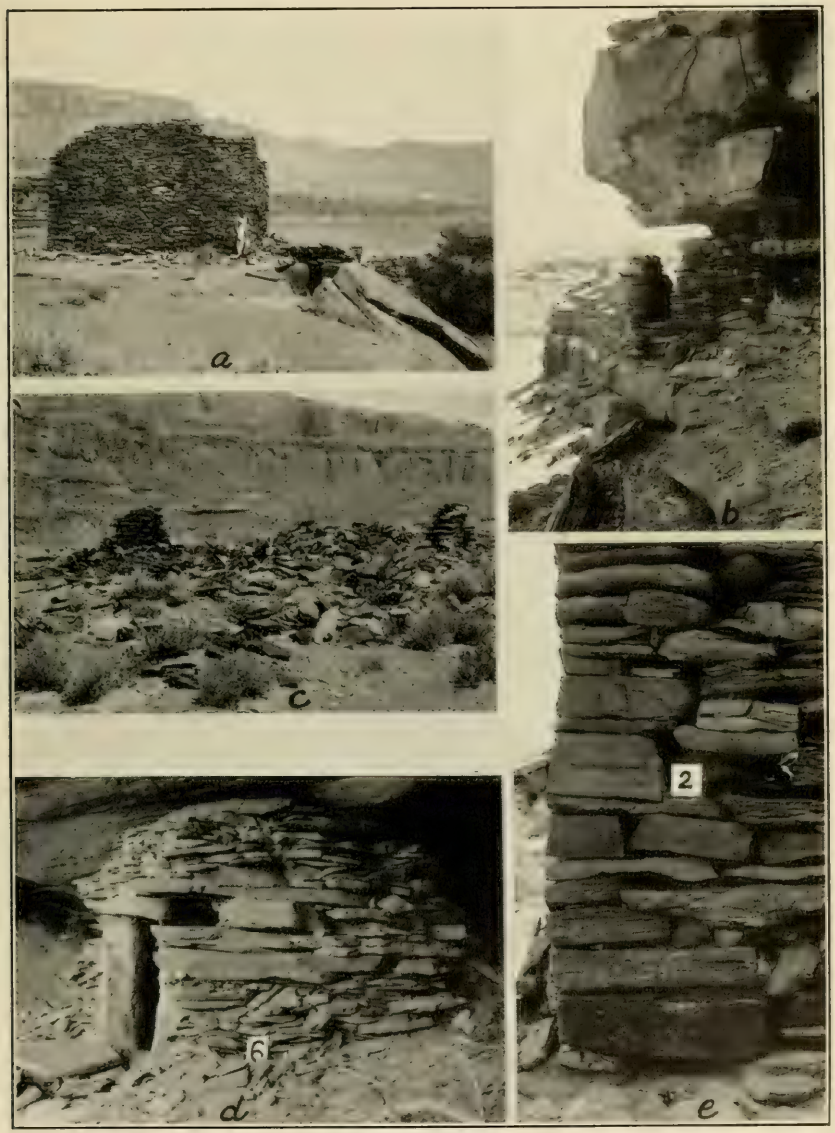
PETROGLYPHS AT SITE 117, JOHNSON CANYON, PARTIALLY CHALKED.

a and *b* form a continuous panel, left to right.



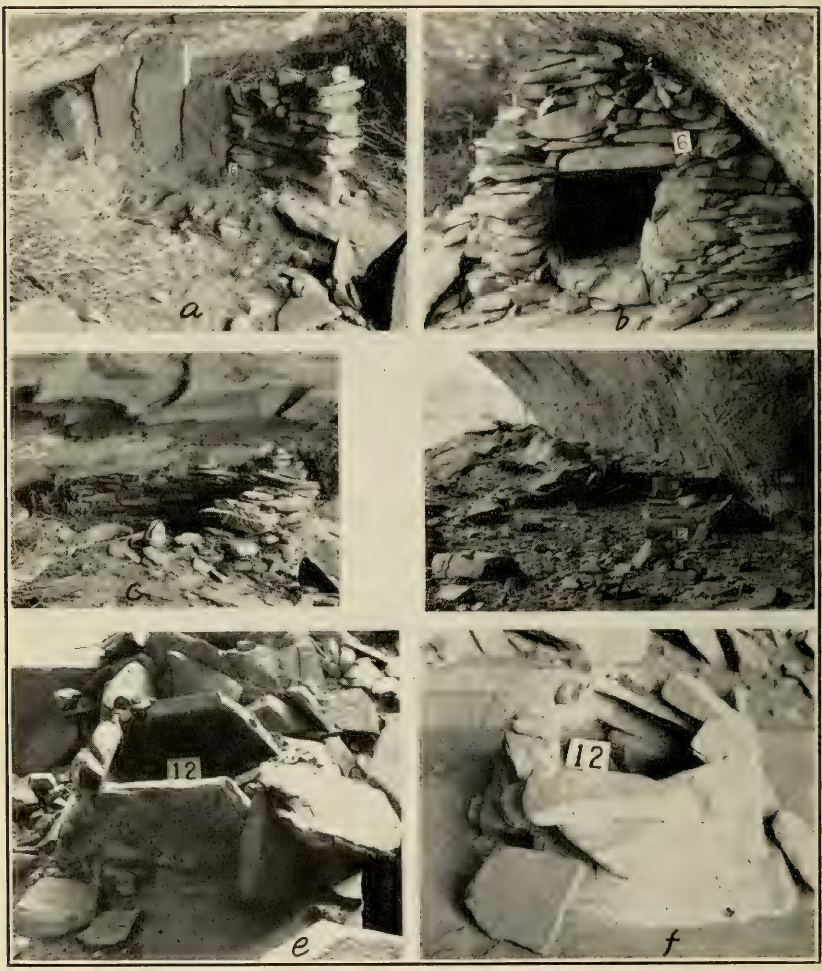
PETROGLYPHS AT SITE 130, OAK CANYON, PARTIALLY CHALKED.

These form a continuous panel, left to right, about 30 feet long.



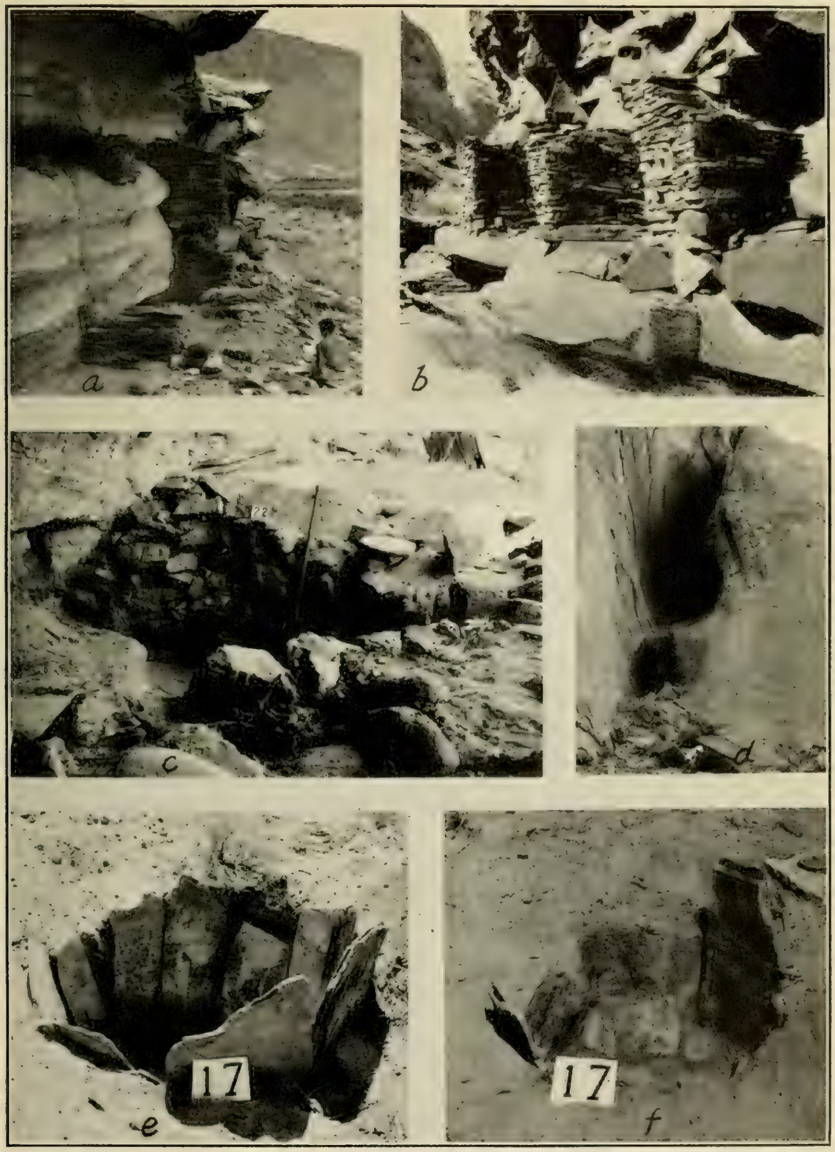
House Ruins.

a, Large house, site 2, White Canyon. *b*, Cliff house south of large ruin, site 2. *c*, Large ruin, site 4, Redd Canyon. *d*, Granary A, site 6, near Lake Canyon (door is on ground in front of doorway). *e*, Detail of masonry of large ruin, site 2.



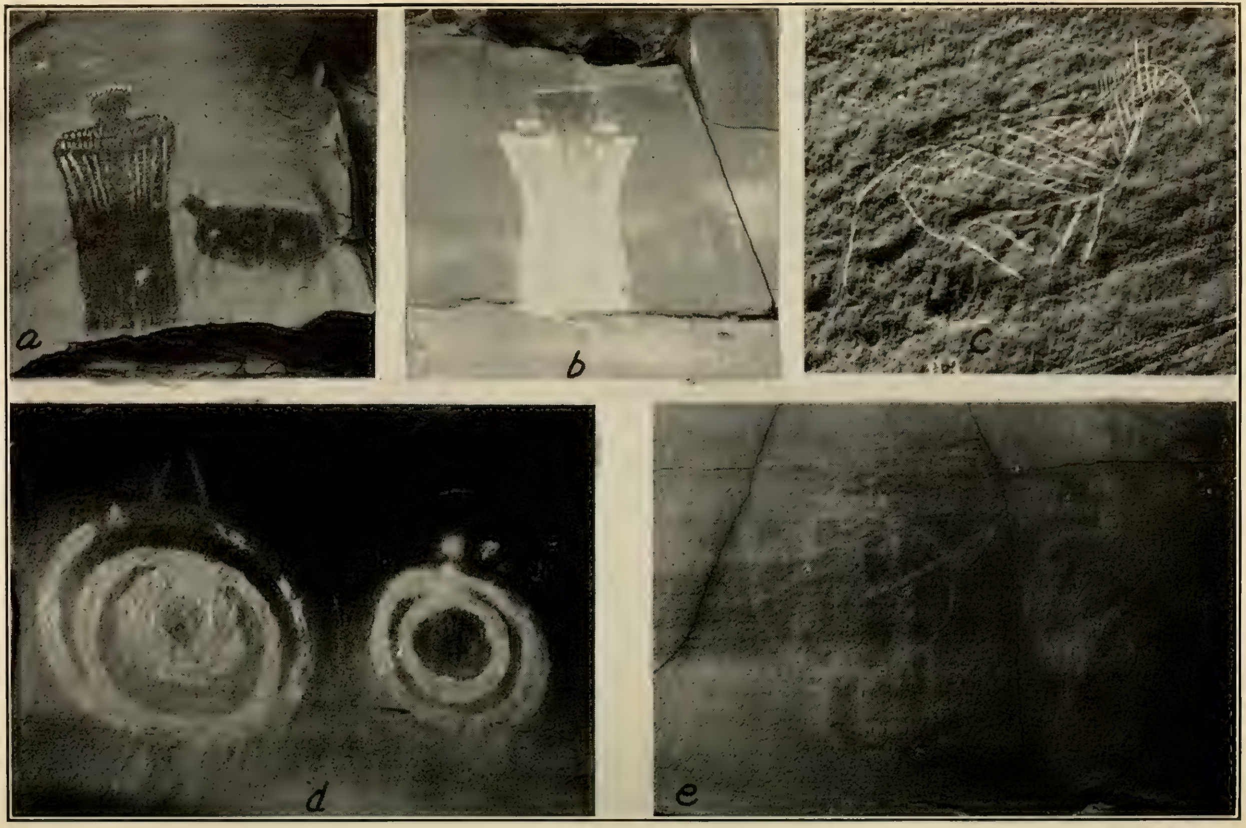
Slab and Masonry Structures.

a, Slab and masonry wall, site 6, near Lake Canyon. *b*, Granary B, site 6. *c*, Kiva, site 6. *d*, Crude house walls, site 12, below San Juan River. *e*, Bin B, site 12. *f*, Bin A, site 12.



HOUSE TYPES.

a, Cliff house, site 4, Redd Canyon. *b*, Masonry walls, site 16, Aztec Creek. *c*, Semisubterranean house or kiva, site 22, Rock Creek. *d*, Cave with wall and leveled floor, site 15. *e*, *f*, slab cists, site 17, Aztec Creek.



PICTOGRAPHS AND PETROGLYPHS.

a, Pictograph in red and white, North Wash; *b*, *d*, pictographs, site 2, White Canyon; *e*, petroglyph, site 2; *c*, petroglyph, site 23, West Canyon Creek; lines are chalked.

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